

An Energy Policy

1991-2005

**Natural Resources and Energy
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SUMMARY OF POLICY INITIATIVES

Energy efficiency and conservation will be the cornerstone of a new energy policy to ensure that adequate energy sources are available to meet the province's needs to the year 2005. Most New Brunswickers are familiar with energy in the form of electricity or petroleum for household, commercial, industrial and transportation use. There are, however, growing concerns about the environmental effects of some energy developments and the government is therefore placing a high priority on efforts to reduce demand through energy efficiency and conservation initiatives.

The indigenous energy resources of New Brunswick have played a key role in meeting our everyday needs but they are insufficient to meet future requirements. Development strategies must be put in place to make up for the shortfall and, at the same time, maintain the quality of life that New Brunswickers want. Access to natural gas will be given a particularly high priority. These approaches will move the province towards an era of sustainable development.

The purpose of this document is to outline an energy policy which will guide the province through the 1991-2005 period. The policy has as its framework three major goals:

1. *To move the province towards a future characterized by sustainable development.*
2. *To pursue an energy strategy that promotes efficiency and conservation of energy use in all sectors of the provincial economy.*
3. *To develop and maintain reasonably priced and secure energy sources adequate to meet the needs of New Brunswickers.*

This section of the report is a concise summary of the government's energy policy thrusts and development initiatives that have been formulated to meet these goals.

Energy Efficiency and Conservation

- ▶ The government recognizes that energy efficiency and conservation offer significant economic and environmental advantages and will play a major role in the transition to an era of sustainable development. Energy efficiency and conservation will be the "cornerstone" of New Brunswick's energy policy.
- ▶ In order to accurately determine the energy savings potential, the province is undertaking a comprehensive study of the energy efficiency and conservation potential of the major consumption sectors. The results will provide a more accurate basis for a policy of reducing a significant portion of New Brunswick's future energy demand through energy efficiency and conservation.
- ▶ Specific energy reduction targets will be established in 1991 for each consumption sector. These targets will be carefully monitored and an annual report will be prepared and made public.
- ▶ The province will begin immediately to implement innovative programs to stimulate consumers, business, industries, institutions, and its own public sector to practice more intensive energy efficiency and conservation.
 - Initiatives to reduce consumption in the residential sector will be undertaken, particularly for the construction of new buildings and in improving the operational habits of existing ones.
 - A new Energy Efficiency Act will be introduced to regulate minimum levels of energy performance of major household appliances.
 - Attention will be given to the commercial and institutional sector, particularly the encouragement of energy service companies to provide energy efficiency services to the private sector.
 - The industrial sector is a major user of electricity in New Brunswick and it will receive priority attention. Emphasis will be placed on the adoption of more energy efficient technologies and cogeneration in cooperation with NB Power.
 - Electricity, the most familiar form of energy to consumers, will play a key role in energy efficiency and conservation for all sectors and NB Power will be shifting their attention toward a consumer focus on end use.
 - Demand-side management (DSM) and cogeneration will play a major role in NB Power's capacity planning for future load growth. A

capacity reduction target will be established upon completion of a detailed analysis of the energy efficiency potential.

- A report on demand side management for end use application will be made public in any electricity rate application before the Public Utilities Board.
 - NB Power's demand reduction target will be reviewed at regular intervals as part of its 20 year supply/demand plan.
 - The government intends to lead by example and undertake a major provincial energy management program in provincially owned buildings.
 - Transportation will be given considerable attention as part of the province's energy efficiency and conservation initiatives, particularly road transportation. The government will continue to work with Transport Canada in updating fuel consumption standards and it will also participate in specific initiatives whenever possible. (ProTrucker, for example).
 - The province will ask the federal government to examine its rail transportation policy, particularly with respect to the environmental advantages of lower atmospheric emissions, compared to road transportation.
- The province will establish an Energy Advisory Service to residential, commercial/institutional, and small industry with a key element of this service being a toll free information telephone line.

Natural Gas

- The government believes that gaining access to natural gas should be the second major thrust of New Brunswick's energy policy.
- Natural gas is a secure reliable primary energy source and critical to decreasing the province's dependency on foreign crude oil.
 - Natural gas offers opportunities for fuel switching thereby providing fuel price competition
 - Natural gas is the most environmentally benign fossil fuel with lower carbon dioxide emissions per unit of energy, no particulates and virtually no sulphur dioxide emissions

- Natural gas provides opportunities for high efficiencies in electrical generation through combined cycle technologies.
- ▶ The government will intensify activities to seek access to Western Canadian natural gas through the extension of the pipeline into New Brunswick from Quebec:
 - Identify opportunities for natural gas use in power generation and large industry with later consideration for commercial/institutional and residential use.
 - Step up negotiation with the federal government for support for extending the pipeline.
 - Update capital costs for the pipeline, complete economic analysis and meet with gas producers, aggregators and pipeline companies.

Environmental Considerations

- ▶ The government will continue with its policy of having all energy development projects carefully screened for Environmental Impact Assessment requirements.
- ▶ Future energy development projects will favour the use of fuels which generate a minimum of harmful emissions. When conditions dictate the use of fossil fuels, the proper emission control equipment will be installed.
- ▶ The province will pursue a number of initiatives as part of a strategy to control atmospheric emissions from energy usage, including controls for electric generating stations, transportation and other uses.
- New Brunswick will work in close cooperation with the federal government to establish and meet sulphur dioxide (SO₂) reduction targets.
- Initiatives will be undertaken to reduce nitrogen oxides (NO_x) and volatile organic compounds (VOC).
- The province will work with Canadian Energy Ministers, to help reach a suitable agreement on reduction targets for carbon dioxide (CO₂) and in addition will undertake initiatives to help reach those targets.
- Energy efficiency initiatives and conservation will be undertaken with a view to substantially reducing atmospheric emissions.

Energy Supply and Demand

- ▶ In spite of the current economic downturn, the annual growth in total energy demand is forecast to average 1.3% over the next 15 year period. This total energy demand includes electricity, gasoline, and many other elements. The province will undertake a number of demand reduction programs and supply initiatives to effectively meet this growth. The NB Power in-province electricity component of this total energy demand is forecast to be much higher than the 1.3% average. It is predicted that NB Power in-province electricity sales will increase by 2.9% per annum in the absence of specific demand-side management programs. Thus, total electricity could increase by 50% in the 15 year period. These figures highlight the importance of a major initiative directed towards energy efficiency and conservation. Although additional supply requirements cannot be eliminated a vigorous program of energy efficiency and conservation can significantly reduce demand.
- ▶ The government will continue to undertake initiatives to ensure that New Brunswick has a reliable and secure source of energy to meet the present and future demands of its customers.
 - Electrical interconnections with neighbouring provinces and New England will continue to serve as a prime means of mutual assistance during emergencies.
 - A contingency plan for any oil shortage that might occur will be developed in cooperation with the federal Energy Supplies Allocation Board.
 - Regular analysis of energy consumption patterns and supply/demand will be prepared.
- ▶ Electricity exports have resulted in rate relief to in-province customers averaging about 8% in recent years. The government's energy policy will be to continue exports where cost savings to New Brunswickers result and where the new generating capacity can be phased back on to the system to meet future domestic needs.
- ▶ The energy savings anticipated from the government's commitment to energy efficiency and conservation may result in a delay in the need for future generation facilities. Consequently, no decisions will be taken on Belledune II or Lepreau II until such time as the energy efficiency study is complete and growth in electricity demand better defined. Neither option can be excluded pending the final analysis of energy efficiency and conservation.

The position of the Government on nuclear power remains unchanged. A new nuclear power plant should only proceed if a market exists for the power generated, the federal government agrees on a cost that is no greater than an equivalent coal-fired thermal plant and it is preceded by a rigorous environmental

impact assessment with full opportunity for public participation.

Peak load requirements will be met with a 100MW combustion turbine unit at Ste. Rose, currently under construction, phase back of combustion units built for export to Hydro-Quebec and construction of units as needed to meet the newly defined demand requirements.

- ▶ Preference will be given to indigenous energy fuel sources if environmental and other costs are similar to imported alternatives.
 - Domestic coal will continue to be utilized but only in conjunction with proper emission control equipment or through such new technological processes as coal gasification.
 - Energy exploration will be encouraged to investigate such local supply alternatives as oil, natural gas and oil shale.
 - The government will continue to explore opportunities for expanded use of wood and wood residue, particularly for cogeneration.
 - The utilization of wood as an alternative energy source offers significant socio-economic benefits in the forestry sector but its continued utilization will require reasonably competitive pricing. The province will encourage its use to the extent that it does not compete with uses of the resource for higher value marketable products.
- ▶ Oil will continue to play a major role in meeting the province's energy demands to the year 2005 but the government will continue to take steps to reduce its dependence on foreign oil for electrical generation and other uses by replacing it with more secure and reasonably priced alternatives.
- ▶ The future expansion of hydro is limited in New Brunswick but it will continue to play a complementary role in meeting peak electrical demands.
- ▶ Orimulsion represents a replacement fuel for coal and will only be used with the installation of flue gas desulphurization equipment.
- ▶ Imports or multi-year power purchases will continue to be used to help reduce oil utilization and price dependency.
- ▶ The government will adopt a policy encouraging non-utility electrical generation and it will facilitate public input into the buy-back rates for such generation. The Public Utilities Board will be instructed to review the buy-back rates offered by NB Power.

- ▶ The province will actively monitor the progress of alternate energy sources as part of the transition to sustainable development. This includes such alternatives as photovoltaics, hydrogen, tidal power, wind, and fuel cells. The province will also initiate new developments in the alternate energy field by promoting industry and academic research and development.
- ▶ The government will undertake initiatives to reduce fuel consumption and promote efficiency in the transportation sector.
 - In cooperation with municipalities increased use of urban transit systems will be promoted.
 - The province will examine freight transportation with a view to considering inter-modal operations.
 - The province will work with the federal government to encourage research and development on new vehicles and fuels to increase efficiency.
 - Fuel pricing and tax structures will be examined to gauge impacts on increasing energy efficiency and reductions in atmospheric emissions.

Energy Policy Management and Responsibility

- ▶ The province will cooperate with the federal government on energy matters of an international nature involving such agencies as the International Energy Agency (IEA). Particular attention will be given to energy security plans and the global energy balance.
- ▶ Cooperation on regional energy matters will be pursued by working through the Northeast International Committee on Energy (NICE), an organization established by the Eastern Canadian Premiers and New England Governors.
- ▶ New Brunswick will work in close cooperation with the federal government to harmonize national energy policy with provincial energy initiatives. Particular attention will be given to energy research and development, a federal/provincial cooperation agreement on energy, energy security and the implications for the province of the "Green Plan".
- ▶ The government will clearly establish the Department of Natural Resources and Energy as the provincial agency responsible for energy policy and give it the resources, authority, and responsibility to carry out its mandate.
- ▶ The government will review its energy related legislation as part of an effort to periodically update its energy policy.

- ▶ The province will coordinate its energy policies with the private sector to help ensure security of supply and cooperation in energy efficiency programs. Oil security of supply plans will also be prepared in cooperation with the private sector and the Federal Energy Supply Allocation Board (ESAB).

Energy Education

- ▶ The government recognizes that the successful implementation of an energy policy requires the understanding and cooperation of the general public. An education program will be undertaken in cooperation with educational institutions and such groups as the Energy Educators of New Brunswick.
- Government will assist the Energy Educators of New Brunswick to carry out a balanced energy education program in the public school system.
- The government will implement a public information program to increase awareness of energy issues and at the same time, encourage consumers to practice a life style that is conducive to more efficient use of energy.

Future Policy Planning

- ▶ The government will pursue a policy of guiding and directing the energy sector through a transition period to an era of sustainable development. The results of the Premier's Round Table on Environment and Economy will play a key role in this policy.
- ▶ It is recognized that New Brunswick's socio-economic conditions will continue to change and therefore some degree of flexibility or adjustment will have to be applied to our energy policy initiatives. The government will monitor its energy policy closely and will evaluate and amend it every five years.
- ▶ While this framework sets out the general parameters of future development, and because this policy is being articulated during a period of significant world economic and political change, it should be recognized that New Brunswick may in the future have to respond to developing international pressures.

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1.0 Introduction

Energy developments are expected to play a significant role in the Province's economic development strategy Toward 2000. At the same time it is recognized that the ability to meet the future energy needs of New Brunswick within the context of sustainable development will be one of the foremost challenges facing the Provincial Government in the 1990's and beyond.

Energy is used by all elements of our society and virtually all citizens are dependent on it to some degree. Our households, businesses, industries, transportation systems, schools, hospitals, and all other institutions could not function without an adequate, secure, and reasonably priced supply of energy. Energy is now considered to be one of the "necessities of life" for all citizens. Many people think of energy in terms of electricity but it involves much more than that. In fact refined petroleum products and wood each represent a larger proportion of energy use. The amount and different forms of energy required to sustain these systems, and the way we utilize that energy, are the major areas of concern that must be addressed by an energy policy.

The importance of energy to New Brunswick's economic well being is evidenced by the fact that the industrial sector consumes 50% of the province's total energy supply (1989). The energy sector accounts for 7% of our gross domestic product and employs 4.1% (11,760) of our labour force. Energy is the second largest contributor to our total commodity exports and stands at 21% (\$638 million) of the total.

The current rate of increase in energy consumption is a global concern, especially among the western nations including Canada. A recent article on the world's energy needs presented a consensus view that sees world consumption as increasing 50-60% by the year 2010¹. Canada is one of the world's highest per capita energy users, and Energy, Mines and Resources Canada predict a 47% rise in energy consumption in our nation between 1988 and the year 2005. By comparison New Brunswick's total energy consumption is expected to grow by 30% under a "business as usual" scenario. These projections could be lowered through structural changes in energy supply and use, and with energy efficiency and conservation measures. Nevertheless, meeting the province's energy needs over the next 15 years remains a formidable challenge.

The energy crisis of 1973 and 1979, and the resulting increases in the price of oil, made energy security a major determinant in formulating Canadian energy policy. The current Middle East situation and the resulting oil price instability keeps the issue of energy

¹ Davis, G.R. Energy for Planet Earth, Scientific American Magazine, September, 1990.

security in the forefront. The province is still dependent on crude oil for 62% of its primary energy supply. This means that it must continue to focus on the issue of diversity of energy supply as part of an energy policy.

A number of energy policy-related statements have been issued by the government since 1987. Early in 1990 a public consultation process was initiated with the objective of seeking public input to the formulation of a comprehensive energy policy. To assist in this task, a report entitled Background Discussion Document on Energy in New Brunswick (1990-2000) was produced for public distribution. Six public hearings were held throughout the province in April 1990 under the auspices of the Energy Sectoral Group of the Premier's Round Table on the Environment and Economy. Their report is entitled Report of the Energy Sectoral Group of the Premier's Round Table on the Environment and Economy. These two documents were the major references used in the development of this energy policy.

The hearings of the Energy Sectoral Group saw widely differing views on a number of issues. Their report outlined a number of specific recommendations on energy efficiency and conservation, cogeneration, renewables, nonrenewables, nuclear energy, electricity exports, energy education, research and development, institutional change, planning, and transportation. The Group was able to reach a general consensus on most topics with differing views being expressed on nuclear energy and exports of electricity. The government was able to incorporate a major portion of the thrust of the Group's recommendations into the energy policy. Nuclear energy, exports of electricity, and the use of coal were given additional attention and the conclusions reached are reflected in this policy.

A noted energy expert has pointed out that "civilization has entered a fundamental transition in the nature of the energy-society interaction"². This period of transition is from an era of cheap and convenient sources of energy such as oil and natural gas to more abundant sources such as coal, uranium, solar energy, and fusion fuels that will require expensive transformation to usable forms such as electricity. It is also evident that the era of more expensive energy is a permanent condition and to this must be added the environmental costs. These general global trends provide useful guidance in energy planning and policy formulation.

The Brundtland report³ refers to this transition period as one in which energy development policies must shift society from an unsustainable era to one of sustainable development. Atmospheric pollutants in particular will have to be addressed as their

² Holdren, John P. Energy in Transition. Scientific American Magazine, September, 1990

³ Our Common Future. The World Commission on Environment and Development, Oxford University Press, 1987.

presence at above desirable levels will continue for the next decade or more. One of the most effective ways to steer Canada through this so-called period of transition and into a more sustainable future is through energy efficiency and conservation. The period can also be used to accelerate activities in research and development of new and longer term energy alternatives. Energy efficiency and conservation will therefore be a major priority of New Brunswick's energy policy.

The purpose of this document is to outline an energy policy for New Brunswick for the 1991-2005 period. The document first of all defines the major goals of an energy policy and outlines the energy policy responsibilities of governments. The report then deals with environmental considerations as a major factor in energy policy formulation. The cornerstone of the province's energy policy, energy efficiency and conservation, is presented with specific initiatives, some of which will be implemented immediately whereas others will be added upon completion of further analysis. A section on energy supply and demand provides the context within which projected energy needs, energy supply alternatives, and end-use consumption are considered. Energy as it relates to transportation is specifically addressed under both supply and demand and energy efficiency and conservation. The final chapter deals with energy education, which must assume a more important role, especially in view of the increased emphasis on energy efficiency and conservation. A summary statement at the beginning of this document provides a concise overview of the Government of New Brunswick's energy policy initiatives and development thrusts for the 1991-2005 period.

It is recognized that the Energy Sectoral Group report is one of 13 economic sector reports that will be integrated into a sustainable development strategy for the province. This document is therefore subject to further revision upon completion of the Premier's Round Table deliberations.



2.0 Major Goals of a New Brunswick Energy Policy

The provincial government considers energy to be an instrument of public policy that affects several facets of New Brunswick's social and economic development. Maintaining secure and reasonably priced sources of energy must be a priority. At the same time an energy development strategy must be implemented with a view to maintaining an appealing quality of life and one that is in keeping with the province's values. A policy of sustainable development will therefore be pursued in an effort to work towards a proper balance between the economy and the environment. Energy efficiency and conservation will form the leading edge of New Brunswick's new energy policy initiatives. Demand reduction initiatives will be supported by a mix of energy supply options in order to guide the province through an energy transition period and into an era of more secure and sustainable energy. Natural gas in particular will be given a high priority. Energy development will continue to be used to help develop and strengthen the province's economy and competitiveness, including the creation of jobs for New Brunswickers.

The major goals of an energy policy that will carry New Brunswick through the 1991-2005 period are as follows:

- 1. To move the province towards a future characterized by sustainable development.*
- 2. To pursue an energy strategy that promotes efficiency and conservation of energy use in all sectors of the provincial economy.*
- 3. To develop and maintain reasonably priced and secure energy sources adequate to meet the needs of New Brunswickers.*

These goals set the stage and form the basis for the energy policy that is outlined in this document.



3.0 Energy Policy Management and Responsibility

3.1 International

The International Energy Agency (IEA) was established in 1974 under the Organization of Economic Cooperation and Development (OECD) and its prime objective is to look after the collective economic and energy security interests of its 21 member nations including Canada. Under its energy security initiative, a program of energy sharing would be initiated if a member's oil supply declined by 7%. Since Canada has abundant energy resources, it would more than likely be called on to help supply the other member nations in such an emergency. A final step in the IEA security plan is to direct its members to ration energy that is designated for domestic use. Another significant IEA policy is for member nations to leave energy pricing to international market forces. Membership in IEA is a significant part of Canada's energy security plans.

Another international organization in closer proximity that could impact on New Brunswick energy policy is the Northeast International Committee on Energy (NICE). The group was established in 1978 by the Conference of New England Governors and Eastern Canadian Premiers to address regional dependence on off-shore sources of energy fuel supplies. It is also an ideal place for the exchange of valuable information on energy issues. New Brunswick's participation in this organization has obvious advantages related to security of supply and regional cooperation.

3.2 Government of Canada

The agency responsible for national energy policy is Energy, Mines and Resources Canada which has as part of its portfolio the National Energy Board (NEB). The Board obtains its authority under the National Energy Board Act which gives it power to regulate such provincial related activities as interprovincial energy development and electricity exports. It also issues licences for international transmission lines and may direct that environmental impact assessments to be held on proposals by provinces to export electrical power.

The major division of responsibility between Canada and the provinces is that the provinces are responsible for the development, resource ownership, and management of energy. Energy security or the assurance of safe and reliable sources of energy for the Nation is a major concern of the Federal Government. The unsettled Middle East oil producing area, and certain decisions by OPEC, serve to remind Canada of the importance of energy security.

Energy research and development is an area where small provinces like New Brunswick will be looking for a strong Federal role. A commitment is required in the advancement of new technologies in energy efficiency and conservation and new energy sources, both imported and indigenous, with the purpose of improving the economic and environmental viability. Some of this work is beyond the scope of provincial capability and New Brunswick will continue to seek increased support from the federal government on this subject.

Historically federal/provincial agreements on energy have significantly contributed to enhanced energy awareness and technological advancement in New Brunswick. An initiative that would appear to be in harmony with the policies of both governments, and one that lends itself to cooperation agreements, is energy efficiency and conservation. It is the intention of the province to maintain close liaison with the federal government on energy matters, especially on research and development as well as the possibility of a cooperation agreement.

The federal government's recently released "Green Plan" contains several energy related initiatives which complement New Brunswick's energy policy. Limitations of greenhouse gases and other atmospheric emissions through energy efficiency and conservation measures, and by the establishment of emission targets and/or standards are common objectives. It is recognized that national policies can have a significant impact on provincial energy initiatives. *The government will therefore continue to work in close cooperation with the federal government to ensure harmonization in energy matters.*

3.3 Provincial Government

Responsibility for the energy sector is currently vested in the Department of Natural Resources and Energy and the provincially owned electric utility, The New Brunswick Electric Power Commission (NB Power). NB Power is governed by a commission made up of 10 government appointed members, including a Chairman who is also a member of the Executive Council. NB Power has a clearly established mandate under the Electric Power Act. The Department of Natural Resources and Energy is a regular government department and, although the Minister is generally considered to be responsible for most energy policy matters, and in fact does have responsibility for considerable energy related legislation, this mandate is less specific and needs further clarification.

This limitation was also identified in the public hearing process and the Energy Sectoral Group report contains "institutional change" recommendations. *The government will therefore be addressing this issue with an expanded and more clearly stated mandate for the Minister of Natural Resources and Energy.*

The department will be given additional resources and will be directed to plan and coordinate all matters of provincial energy policy. This is especially true in the area of energy efficiency and conservation and total energy demand projections where there is a

pronounced need for central planning and management of programs not only across government departments and agencies but throughout all sectors of the New Brunswick economy.

3.4 Existing Legislation and Regulatory Framework

It is of significance to note that there are currently 11 statutes that deal with energy in New Brunswick.

1. Oil and Natural Gas Act - All oil and natural gas in the ground is separate from soil and is the property of the province. The Act sets out the rules for exploration, allocation and extraction of oil and natural gas.
2. Pipe Line Act - Pipeline refers to a flow line, gas line, oil line, mineral line, secondary line, distribution line or private line as determined by the Minister. It does not cover interprovincial lines which are federal matters. The Act provides for the issuing of permits for construction and inspections and may involve hearings before the board of Commissioners of Public Utilities.
3. Gas Distribution Act - Provides for the awarding of gas distribution rights.
4. Gas Public Utilities Act - Provides for the regulation of gas distributors and distribution systems.
5. Gasoline, Diesel Oil and Home Heating Oil Pricing Act - Provides for the regulation of prices, dealer margins, posting of prices, and promotional merchandising.
6. Bituminous Shale Act - Provides for the regulation of exploration, development and production of oil shales.
7. Underground Storage Act - Provides for the regulation of exploration, development and operation of underground cavities, natural or artificially made, that may be used for storage of liquids and gases.
8. Gasoline and Motive Fuel Tax Act - Provides for the levying of taxes on refined petroleum products and the licensing of outlets.
9. Public Utilities Act - Provides for the regulation of companies supplying what is considered to be a public utility such as natural gas and some pipelines. As a result of recent legislation amendments, NB Power must go before the Public Utilities Board to obtain authority to change power rates. These amendments include the establishment of an intervener to represent the interests of the public.

10. Mining Act - Insofar as it applies to coal exploration and development.
11. Electric Power Act - Establishes a government appointed Commission with a mandate to provide a continuous supply of energy adequate for the needs and future development of the province. It also provides authority to promote economy and efficiency and conservation in the generation, distribution, supply, sale and use of power.

Most of this legislation deals with the exploration, extraction, and regulatory use of fossil fuels. Of significance is the recent change in the Public Utilities Act that requires NB Power to go before the Public Utilities Board to obtain authority to change power rates. In addition there are other statutes (Clean Environment Act, for example) that have an indirect but significant impact on provincial energy policy.

The Minister of Natural Resources and Energy is responsible for most of the energy legislation in the province. NB Power is directly responsible for the Electric Power Act. Environmental legislation rests with the Minister of the Environment.

The government intends to review its energy related legislation as part of an effort to periodically update its energy policy.

3.5 Private Sector

In 1989 the private sector supplied 79% (174,600 Terajoules) of New Brunswick's total energy supply, mostly in the form of wood, wood residue, and refined petroleum products⁴. It should be noted however that useable energy supplied by the private sector is actually about half of that indicated due to combustion efficiencies, while that supplied by electricity (21% or 47,500 Terajoules) is all in useable form. New Brunswick also has the largest oil refinery in Canada with a capacity of 250,000 barrels per day. The transportation sector is the prime user of private sector energy and, with a major effort being directed to energy efficiency and conservation, it indicates the significant role that the private sector must play in energy policy initiatives.

The province intends to coordinate its energy policies with the private sector to help ensure security of supply and cooperation in energy efficiency and conservation programs. The province will also prepare oil security of supply plans in conjunction with the federal Energy Supplies Allocation Board.

⁴ One Terajoule (TJ) is equivalent to 165 barrels of oil. The province's total energy supply of 222,000 TJ, in 1989 is equivalent to 36 million barrels.

4.0 Environmental Considerations

New Brunswick's energy policy has been designed to initiate a movement toward the integration of environmental and economic considerations, while allowing flexibility to accommodate the province's transition to the adoption of a sustainable development strategy. A proposed framework for this strategy is expected to be delivered by the Premier's Round Table on Environment and Economy during the 1991 calendar year. This strategy is expected to influence policy directions for New Brunswick in the future.

It is recognized that an energy policy is a major part of any sustainable development strategy. An energy policy for the province will incorporate aggressive measures aimed at energy efficiency and conservation. These measures will have a direct beneficial influence on environmental impacts, sustainability of both renewable and nonrenewable resources, and the viability/competitiveness of our economic base. Air emissions associated with energy production are now regarded to be of concern to the global environment, and can no longer be considered in a local or regional context only. Accordingly, energy policies will be adapted to be consistent with national objectives on issues such as sulphur dioxide and carbon dioxide emissions. It is clear that New Brunswick's energy policy must be harmonized with federal/provincial initiatives, therefore, the government will actively participate in the development and pursuit of national environmental objectives.

4.1 Environmental Impact Assessment

Environmental impact assessment (EIA) is the government's primary method used to evaluate environmental impacts of major energy production projects. The basis for EIA in New Brunswick is a regulation under the Clean Environment Act. The EIA process provides opportunities for an analysis of environmental and socio-economic impacts, and a forum for public discussion of those impacts. EIA can be used to examine the environmental sustainability of undertakings, and therefore is an important tool to be used by government decision makers.

A process is underway in New Brunswick and in Canada, generally, to increase the usefulness of EIA as an instrument of the decision process, and to ensure a measure of consistency and predictability in the implementation of EIA across the country. *The province is currently reviewing its regulations governing EIA procedures*, in consultation with public interest groups and proponents, and is working with other provinces and the federal government to effect improvements. It is anticipated that these discussions will result in greater EIA process harmonization.

Environmental impact assessment of energy related projects has been applied to specific development proposals, such as electrical generating stations and transmission lines. Although these project reviews are beneficial in identifying problem areas and initiating

environmental protection measures, a more broad approach may have to be taken in some areas of energy development. *NB Power will be preparing a 20 year supply/demand plan, which would be subject to review by the Public Utilities Board.* Such a plan should address domestic demand, capacity, surplus power sales and demand side management, and examine associated environmental impacts. NB Power will be required to update and submit the supply/demand plan for review at regular intervals to ensure currency.

The government will continue with its policy of having all specific energy development projects carefully screened to determine environmental impact assessment requirements.

4.2 Atmospheric Emissions

Many of our methods of energy production and utilization pose environmental challenges of varying types and degrees of significance. Fossil fuel power generation, transportation and many industrial energy using activities, make the issue of atmospheric emissions particularly important in the context of the energy policy. Recent studies provide considerable information on emission trends and impacts from now through the year 2005. The major emissions of concern include sulphur dioxide, nitrogen oxides and carbon dioxide. Sulphur dioxide and nitrogen oxides are contributors to the problem of acid rain. Nitrogen oxides are also implicated in the formation of ground level ozone, a contaminant which presently exceeds acceptable concentrations in certain regions of Canada for significant periods of time. Carbon dioxide is a major greenhouse gas, thus exacerbating the problem of global warming.

4.2.1 Sulphur Dioxide (SO₂)

Concerns over acid rain have focused primarily on SO₂. The major source of SO₂ in New Brunswick is electricity generation by fossil fuelled generating facilities. Since 1980, discussions within Canada and between Canada and the United States have attempted to bring about continental reductions in emissions of this pollutant. In 1985, Canada decided to reduce these emissions in eastern Canada by 50%. New Brunswick agreed to assist by implementing a total annual reduction of some 30,000 tonnes by 1994. Other source sectors have made a considerable contribution to this reduction through various means, including process changes. However, NB Power is faced with major expenditures for emission control equipment or the purchase of lower sulphur fuels to achieve these reductions.

NB Power has proposed a plan that will allow it to limit emissions to 130,000 tonnes per year by 1994, some 70% of the provincial total allowed for in the 1985 agreement. However, the province has recently agreed to a further voluntary reduction of 10,000 tonnes (annual basis), indicating that from 1994 onwards, total sulphur dioxide emissions in New Brunswick must not exceed 175,000 tonnes per year. Recent legislative events in the United States will ensure that their own sulphur dioxide emissions will be substantially reduced, thus we will realize the regional and global benefits of reductions in acid rain precursors.

It will be the province's policy to implement any means necessary to enforce present and future commitments to limit total emissions of SO₂. This includes pursuing access to natural gas as part of a long term strategy.

4.2.2 Nitrogen Oxides (NO_x)

Nitrogen oxides contribute to acid rain formation, and also play an important role in the formation of ground level ozone. The province's energy policy, in concert with national initiatives, *will provide for the determination and implementation of measures designed to reduce NO_x emissions* using both control methodology, reductions in energy usage, and the encouragement of alternative industrial process schemes. Such measures include energy efficiency and conservation; demand-side management; performance standards; audits; vehicle inspections; new power plant standards such as new burners; selective catalytic reduction (scrubbers); and water injectors.

It should be noted that ground level ozone is created by the interaction between NO_x and VOC's (volatile organic compounds) in the presence of sunlight. VOC's are organic compounds that readily evaporate into the atmosphere. They include the light ends of gasoline and solvents; and unburned organics from combustion processes such as internal combustion engines and boilers. Measures targeted at reducing VOC's include energy efficiency and conservation through vehicle standards; controls in petroleum products to provide for vapour collection at all stages of product transfer; and reformulation of paints, adhesives, sealants and other coatings. *The government is committed to undertaking programs aimed at reducing VOC's as well as nitrogen oxides.*

4.2.3 Carbon Dioxide (CO₂)

CO₂ emissions are believed to be contributing about one half of the so called "greenhouse effect". Energy related emissions account for about 97 per cent of Canada's known man-made CO₂ emissions. Although Canada's contribution to global energy related CO₂ emissions is small (approximately 2 per cent), it ranks high among industrialized countries in terms of energy related carbon dioxide emissions when measured on a per unit of population or per unit of national income basis. Canada is second among industrialized countries in terms of energy CO₂ emissions per capita, and sixth in terms of emissions per unit of GDP. It is one of the largest users of energy per unit of output (GNP) in the world.

The province has completed projections of CO₂ emissions through to the year 2005 and has examined abatement measures. New Brunswick will face major challenges in implementing its future energy development initiatives as it attempts to limit or reduce CO₂ emissions.

Due to the mix of energy sources available in this country, Canada as a whole emits considerably less CO₂ per unit of energy consumed than many other countries. Although

New Brunswick's energy supply options are limited at this time, there still appears to be a significant opportunity to reduce CO₂ emissions through improvements in the efficiency with which we use energy in the province. New Brunswick's energy policy therefore focuses on taking advantages of opportunities for emission reductions by promoting efficient energy use.

The 1988 Toronto Conference on "The Changing Atmosphere: Implications for Global Security", sponsored by Canada, issued a Conference statement that called for the establishment of energy policies to reduce the emissions of CO₂ and other trace gases in order to reduce the risks of future global warming. Stabilizing the atmospheric concentrations of CO₂ was an imperative goal. The Conference also recommended as an initial global goal the reduction of CO₂ emissions by approximately 20 percent of 1988 levels by the year 2005. About one half of this reduction would be sought from energy efficiency and other conservation measures. The other half should be effected by modifications in supplies.

Subsequent to this Conference statement, Canadian Energy Ministers reviewed the Conference recommendations, and concluded that the 20 percent target was clearly ambitious. The Energy Ministers agreed that the consequences of inactions were unacceptable and agreed to pursue national and regional initiatives that would reduce greenhouse gas emissions and that would be socially, economically and environmentally attractive to society.

Canada's response to the challenges of addressing the climate change problem was outlined recently at the Second World Climate Conference. With respect to CO₂ emissions, Canada has committed to stabilize at 1990 levels by the year 2000. A National Action Strategy for accomplishing this objective has been prepared, in consultation with the provinces. It includes greater efficiency and conservation, reforestation, improving the scientific basis for decision making, and public education and information.

New Brunswick is committed to doing its part to support a national limitation strategy for CO₂. It will also examine the technical and economic feasibility of reducing CO₂ emissions from 1990 levels, such as the 20 per cent called for by the 1988 Toronto Conference. In developing actions to support national objectives, it will be the province's policy to conduct a complete examination of the economic impacts of CO₂ stabilization or reduction and the associated environmental benefits (e.g., SO₂ and NO_x reductions). All analyses will include consideration of the socio-economic implication of climate change.

It is important to note that this is a national strategy, and that regional differences will dictate the ways in which each province and territory address this issue. For example, New Brunswick's limited energy supply options significantly limit the range of measures which can be economically implemented to limit emissions. A comparison of CO₂ emissions by fuel type is outlined in Table I. In order to increase our flexibility in effecting emissions reductions, it will be a policy to enhance the energy supply mix by aggressively seeking to make natural gas available as an energy option.

Those energy efficiency and conservation initiatives outlined in Section 5.0 of this energy policy represent the most economic ways of reducing our energy consumption (and energy related emissions of CO₂), given our current knowledge of the nature of the global warming problem, and the technical potential of energy efficiency and conservation measures.

Table I
CO₂ Emissions by Fuel Type

Fuel Type	CO ₂ Emissions (Tonnes/TeraJoule)
Nuclear and Hydro	0.0
Natural Gas	49.7
Propane - Transportation	59.8
LPG's	59.8
Refined Petroleum Products	
Motor Gasoline	68.0
Diesel	70.7
Light Fuel Oil	73.1
Heavy Fuel Oil	74.0
Coals	
Anthracite	93.1
Bituminous Canadian	92.1
Bituminous Imported	88.9
Sub Bituminous	99.0
Lignite	108.4
Wood	
Residential	81.5
Industry	100.0
Coke	86.0

Source: Energy, Mines and Resources Canada

4.3 Initiatives to Reduce Emissions

The following initiatives will be pursued to achieve the objectives of reducing energy related atmospheric emissions:

- ▶ Energy Efficiency and Conservation Initiatives - Those initiatives outlined in section 5.0 will have the effect of substantially reducing atmospheric emissions.

- ▶ Emission Controls - New Brunswick will move towards the implementation of requirements for best available control technology. This will include considerations of fuel characteristics, as well as pollution control equipment, in a context of economic viability.
- ▶ Energy Alternatives - The energy policy makes provision for the study and appropriate promotion of alternative energy production methodologies, including hydro, cogeneration, wood fired, nuclear and natural gas, all of which hold potential for significantly reducing the emission of certain atmospheric pollutants.
- ▶ Transportation Efficiency and Conservation - The government, in its various departments, agencies and Crown corporations, will enhance existing efforts to increase its fleet efficiency and conservation and reduce emissions. In addition, it will undertake an information program designed to encourage similar initiatives in the private sector.

5.0 Energy Efficiency and Conservation

Energy efficiency and conservation is at the forefront of New Brunswick's energy policy. It is being given a high priority as it benefits both the environment and the economy, consequently moving the province towards a future characterized by sustainable development.

Energy efficiency is broadly defined to capture actions applied across the complete fuel cycle. As such any improvement in energy efficiency can be regarded as any action, including conservation, undertaken by a producer or a consumer of energy products which reduces energy loss or usage during any part of the fuel cycle. It may occur not only in conversion to its final energy form but also during production of primary energy resources or the transformation to intermediate or final energy forms.

Energy efficiency can be related to a reduction in energy input requirements per unit of output, with the benefits resulting in improved economic competitiveness, reduction in pollutants generated, and greater security of supply. Energy efficient measures can delay the need to develop new energy resources and production facilities which can avoid added environmental stress.

Substantial gains in energy efficiency and conservation stimulated by market forces and energy policies since the early 1970's have had beneficial effects on the environment. They have at least offset significant degradation that would have occurred from growth in energy demand.

Historically, efficiency and conservation enhancements have been taken largely in response to higher energy prices or related competitive pressures, particularly where technological change has permitted enhancement. For example, the energy intensity of industry in OECD countries decreased 3.9% annually from 1979 to 1985 during high energy prices and decreased to 1.1% per year from 1986-1988 when prices fell significantly.

Traditionally, energy policies have been developed from a supply perspective without much question of managing the demand-side. In recent years environmental concerns for acid gas emissions have caused all governments to regard energy efficiency and conservation as a "supply-side" option with ensuing benefits. A Federal-Provincial-Territorial Task Force on Energy and the Environment on "greenhouse gas emissions" and projected impact on global warming, concluded in a 1989 study that "by far the largest reductions (in CO₂ emissions) occur through energy conservation and efficiency. Such conclusions have been endorsed by analysts and political leaders alike at all levels.

Claims are made in various references that energy efficiency actually stimulated economic growth in some countries such as the United States and Japan between 1973 and

1986. It is uncertain whether this is true in New Brunswick but, as illustrated in Figure 1 it is clear that economic growth is at least not affected by the adoption of energy efficiency and conservation. Real Domestic Product (GDP) in New Brunswick grew at a fairly constant rate throughout the period from 1973 to 1988, with the exception of a brief recessionary period from 1980 to 1982. On the other hand, the rate of energy consumption dropped significantly through the period of high energy prices between 1980 and 1986. It should also be noted that this was a period of high energy efficiency and conservation program activity. While the rate of consumption has increased it should be noted that the population has also increased, as well as the economic prosperity in New Brunswick.

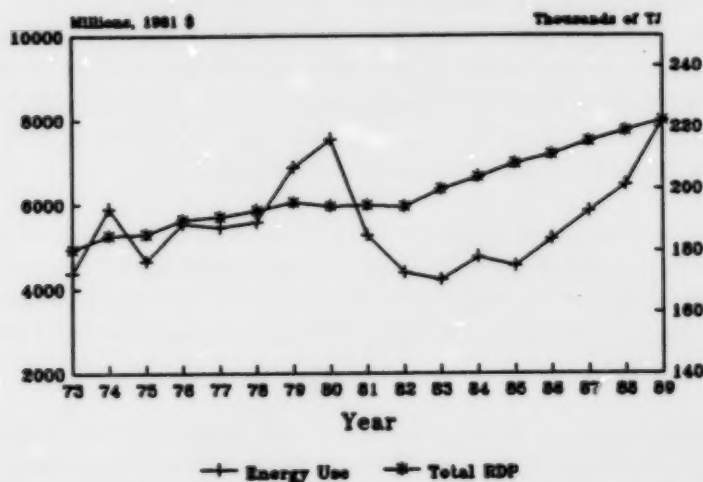


Figure 1 Energy Consumption vs. Real Domestic Product, 1973-1989.
Sources: Stats. Can. #57-202 & #57-003, Quarterly Report on Energy Supply Demand in Canada, 1973-1989.

The Benefits:

Energy Efficiency and conservation is recognized as having very beneficial impacts on the economy and the environment, in particular:

Energy expenses are reduced in all sectors, leading to increased consumer spending, and competitiveness of New Brunswick's industry:

- ▶ Investment in the New Brunswick economy is effected;
- ▶ Jobs are created in the design, fabrication, installation and maintenance of energy saving systems;

- ▶ More expensive and risky supply side options are deferred;
- ▶ Large quantities of pollutants including CO₂ are avoided;
- ▶ Dependence on foreign oil is reduced and security against energy price shocks and supply disruptions is improved;
- ▶ Higher quality products are promoted, thus improving comfort levels and the quality of life in New Brunswick;
- ▶ Technology is advanced through greater sophistication of control and monitoring systems;
- ▶ Reduced use of nonrenewable energy forms.

Energy Profile:

To more clearly understand the issues of energy and the environment and where to begin with more controlled energy use, it is useful to consider the energy consumption profile of the province. Figures 6 and 7 (pages 35, 36) illustrate the proportions of the various energy forms used in New Brunswick and the distribution of energy use by sector. The dominance of imported oil is evident as well as the little recognized proportion that wood provides. Figure 8 (page 37) illustrates where the energy is used by sector. These energy consumption patterns carry definite implications relative to energy policy priorities and the role energy efficiency and conservation can play.

Such implications include improved security of supply to offset the continued high dependency on crude oil derived from offshore sources. A further implication arises from industry's high percentage of total energy consumption.

By translating the energy use data into environmental pollutants information, such as that showing the carbon dioxide emissions associated with energy consumption by sector, the energy and environment link is illustrated. (See Figure 2). It is apparent that any initiative to reduce environmental stress through managing energy use must be applied to all sectors. Even though there will be components of the major sectors that will deserve priority, each of these major sectors as a whole offers significant opportunities for energy efficiency and conservation improvement and emissions reduction.

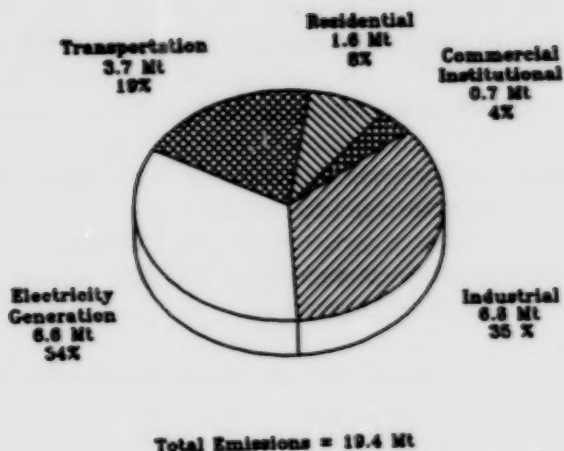


Figure 2 New Brunswick Carbon Dioxide Emissions, 1988.

Efficiency and Conservation Potential

It has been suggested by some authorities that achieving the same pollution reduction as accepted abatement measures, such as SO₂ scrubbers on power plants, can be achieved at a lower cost or the same cost through energy efficiency and conservation. An example of this is where the American Council for an Energy Efficient Economy has estimated that the midwest region of the U.S. could achieve a 55% reduction in SO₂ emissions while saving 4 to 7 billion dollars rather than costing the same amount on normal abatement measures. No such claim can be made with confidence at this time in New Brunswick, but a study of the energy efficiency and conservation potential should provide the necessary information. The outcome of such a study will produce, what are called, **energy efficiency supply curves** which can be compared economically to new energy supply options. They are essentially a measure of economic energy savings potential or the amount of new energy supply that might not be needed if energy efficiency and conservation measures are adopted. The energy efficiency supply curves can be easily translated into pollution reduction curves.

Energy efficiency supply curves will also function as an indispensable tool for designing, implementing, and monitoring efficiency and conservation programs. The curves are fundamentally a computer model of energy use and waste within a sector that can be manipulated to ascertain the effect of exterior interactions, such as the promotion of heat pumps in the commercial sector or impact of financial incentives to upgrade lighting. It becomes possible to estimate the impact of specific programs so that they can be evaluated equally. It is the role of government to analyze possible cost effective opportunities in the way of awareness and informational programs.

Even though an estimate of the energy efficiency and conservation potential is not presently available for New Brunswick, the level can be speculated upon based on information from other jurisdictions. For example, a recent study by the Department of Energy in the UK states that the overall potential energy savings that can be economically justified are 10% for energy management or just "good housekeeping", a further 10% for retrofit investments with a 2 year payback and still further 10% saving for 5 year payback investments. These estimates are reasonable, based on indications from the programs currently and previously delivered in New Brunswick.

In analysis of the energy intensity levels of all provincial government owned buildings the potential for improved efficiency and conservation has been estimated to be \$3.7 million annually.

The Energy Sectoral Group of the Premier's Round Table on Environment and Economy in its October 1990 report has also recommended energy efficiency and conservation as a priority in developing a sustainable strategy for New Brunswick. In fact they recommend that it should be pursued before other supply-options are considered and proposed a number of recommendations for energy efficiency and conservation measures.

Energy efficiency and conservation is the cornerstone of New Brunswick's energy policy for the long term. Fundamental to this is an immediate analysis of the technical potential and achievable energy efficiency and conservation potential for all sectors which will be carried by specialists in this field. Whenever possible, this will be combined with any energy efficiency and conservation studies currently underway by NB Power.

5.1 Residential

Energy consumption in the residential sector of New Brunswick was 18% of the total consumption in 1989 (Figure 3) or about 40 petajoules.

In 1977 New Brunswick introduced the Home Energy Conservation Loan Program (HECL) which amounted to an interest buy-down program to help the residential sector improve the house envelope and reduce heat loss. Over the 10 years of the program more than 28,000 loans were issued with a value of \$28 million. This was subsequently replaced with the Conservation and Electrical Improvement Loan (CEIL) program offered by NB Power and expanded to include small business owners.

The province also participated in energy programs under cost shared federal-provincial agreements and the R2000 Program in cooperation with the New Brunswick Home Builders Association. It has also supported such programs as "Habitation" held annually to provide instructional workshops for home builders.

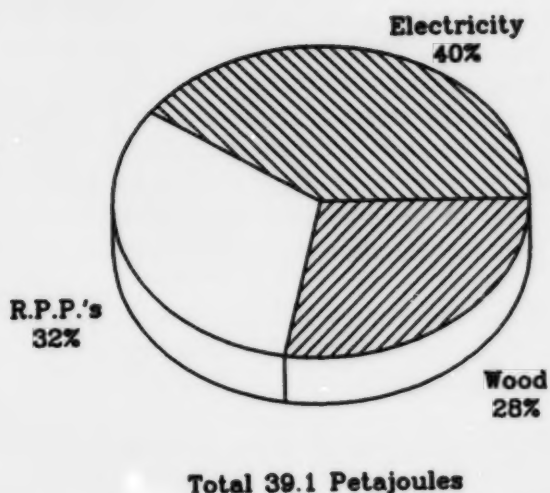


Figure 3 Total Energy Consumption, Residential Sector, 1989. Source: Stats. Can. #57-003, 1989 Q4.

Many of the measures implemented by home owners following the 1979 price escalation remain relevant today, although they have been enhanced by improvements in technology. However, a variety of barriers exist which can hamper the full exploitation of the economic potential of these measures or at least slow down their market penetration. The most important are lack of customer awareness about potential savings, low technical skills and constraints in disposable income. In addition, the split in responsibility in the residential sector for the energy efficiency and conservation investment (landlord responsibility) and the operating costs associated with the use of energy (tenant responsibility) is a remaining barrier to the widespread introduction of efficient equipment in this sector.

The most promising gains in the residential sector would appear to lie in the incorporation of improved energy efficiency and conservation into new structures and equipment and in changes of operational procedures and habits.

Building Energy Performance Standards

Government regulation can effect a significantly large impact on energy efficiency, at a minimal cost by the adoption of minimum energy efficiency standards in building construction. Such regulation is already in place in some provinces as part of their building codes.

New Brunswick has joined with the other provinces and the federal government in support of the redevelopment of a national code for energy efficiency standards for buildings. The work is being carried out at the Institute for Research in

Construction at the National Research Council of Canada and involves the updating of an earlier document entitled "Measures for Energy Conservation in New Buildings". The new code is expected to be available within about two years and all provinces are being encouraged to adopt it entirely or in part as appropriate to the province. It is intended to be a companion document to the National Building Code.

New Brunswick does not have its own building code. Building standards are administered in the form of the National Building Code (NBC), but on a mandatory basis only in incorporated areas and only in part elsewhere. The province has not yet adopted the NBC on a province wide basis except for the fire prevention section and to some extent, the plumbing code. This overall mandatory use of a building code is important for the effective adoption of energy efficiency standards. The standards should be prompted as voluntary initially and considered mandatory along with the building code within a few years thereafter.

Any energy efficiency code will be designed to include measures that are economic to the user thereby creating no economic hardship in its application. In addition *New Brunswick will continue to work with EMR Canada and the National Research Council in updating building energy performance standards.*

The province will examine opportunities to expand application of the National Building Code with inclusion of energy efficiency standards.

Energy Efficiency Act

Regulation is an instrument of government which can overcome some of the market place failings and provide substantial benefits to the energy consumers through greater energy efficiency and lower operating costs. The regulation of minimum levels of energy efficiency major household appliances, other energy consuming equipment and buildings are effective low cost energy saving measures.

New Brunswick intends to keep pace with the regulations that are being introduced in other provinces in Canada and in the U.S. This is intended to both protect our consumers from the dumping of inefficient equipment on the local market by those jurisdictions with regulations, and to effect the substantial energy savings that would result. It is preferred that such regulation take place at the federal level thus ensuring consistency across the country and avoiding duplication of effort in individual provinces.

As it could take some time for federal legislation to come into effect *the province intends to introduce its own legislation that will enable the regulation of minimum energy performance levels of major household appliances on a parallel schedule with other provinces.* Provisions will be included which will enable the future regulation of other energy consuming appliances in the commercial and industrial sectors.

Future refinement could lead to the development of a rating system where the home, as a total system, is evaluated on the basis of efficiency and labelled accordingly. Such systems are functioning in the U.K. and are known to substantially increase consumer awareness.

5.2 Commercial and Institutional

Energy consumption in the commercial/institutional sector of New Brunswick was 8% of the total 1989 consumption (Figure 4) or about 18 petajoules.

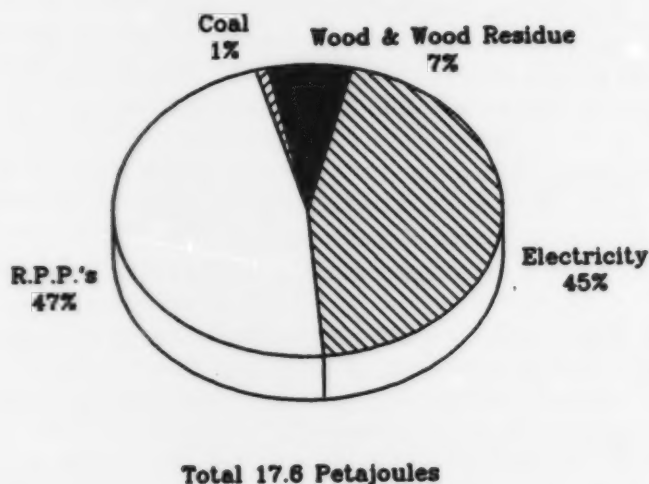


Figure 4 Total Energy Consumption, Commercial - Institutional Sector, 1989. Source: Stats. Can. #57-003, 1989 Q4.

Historically, the province has participated in energy audit and demonstration programs under cost-shared federal-provincial agreements.

As with the residential sector, there is significant potential for efficiency and conservation improvements in building shell enhancements as well as in heat recovery systems and control systems. Similar barriers exist to their market introduction, as is the case for the residential sector.

The lack of technical skills in the commercial sector hinders the application of efficient technologies, especially for small enterprises which are often not aware of the possible efficiency and conservation improvements and whose energy costs may sometimes be only a small component of their operational costs.

The lack of technical expertise can be overcome by *encouraging Energy Service Companies and others who promote energy efficiency and conservation through turn-key retrofits financed with energy consumption savings.*

Comments in Section 5.1 regarding application of the National Building Code and energy efficiency and conservation measures apply equally to the commercial/institutional sector.

5.3 Industrial

Energy consumption in the industrial sector was 50% of the total consumption in 1989 (Figure 5) or about 111 petajoules.

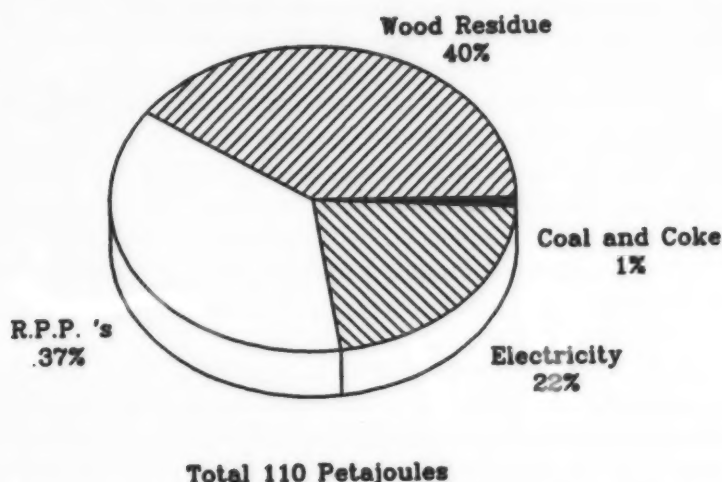


Figure 5 Total Energy Consumption, Industrial Sector, 1989.

Note: Includes producer's use. Source: Stats. Can. #57-003, 1989 Q4.

Significant efficiency and conservation improvements were made by industry during the period 1979 to 1985, as is evidenced by Figure 1 showing energy consumption versus Real Domestic Product. The lower industrial fuel consumption represents not only an improvement in energy efficiency and conservation but also changes in industrial structure which reduced demand as the structure becomes less energy intensive. Changes in the activity level of industry also impact on energy consumption. Overall reduction for efficiency and conservation gains and structural changes can be offset by increased industrial activity.

A recent report by the International Energy Agency (IEA) for a number of member countries on the industrial sectors showed that, generally, efficiency and conservation gains drive energy intensity trends downward more than did structural changes in the period 1973 to 1985. Production changes in New Brunswick also influence overall energy intensity although they can result in increased electricity intensity as is the case in switching from chemical to mechanical pulping processes.

Overall gains in energy efficiency and conservation during 1979 to 1985 were, in large measure, driven by fuel price escalation and the economic downturn forcing the industrial sector to remain competitive. Continued gains in efficiency and conservation do not continue to the same extent during periods of low energy prices as has been evidenced during the mid 1980's. However, the increasing costs to meet environmental standards and achieve sustainable development will add incentive to again view energy efficiency and conservation as a high priority in the 1990's. Industry must also be cognizant of both internal energy costs for direct fuel consumption as well as the externality costs associated with energy conversion, such as electricity.

The appearance that electricity is an environmentally "clean" form of energy must be placed in the context of not only "point of use" but also "point of generation".

Industry consumed 43% of all in-province sales of electricity in 1989 and should therefore assume some responsibility for environmental pressures faced by the Crown-owned utility in meeting future capacity generation. To reduce individual industry environmental fuel emissions by switching from fossil fuels to electricity merely passes the problem from one source to another. Industry must therefore work closely with NB Power in identifying energy efficiency and conservation opportunities and any restraints that might preclude their implementation.

One such opportunity is the "Curtable Load Rate" for large industrial customers. This rate provides credits equivalent to the cost of combustion turbine capacity for industries that can reduce their load during utility peak load periods. This program enables NB Power to reduce its peak load requirements thereby avoiding purchase of combustion turbines for peak load capacity.

Government will work with industry to remove barriers to the adoption of more energy-efficient technologies. These include:

- ▶ the invisibility of energy consumption, efficiency and conservation gains for all but the largest industrial concerns;
- ▶ lack of information and technical skills, especially for small and medium size industries;
- ▶ perceived risk towards adopting newer, innovative technologies;
- ▶ desire to minimize production disruptions; and
- ▶ access to or competition for capital for energy efficiency and conservation improvements.

Opportunities for improved energy efficiency in electricity production by cogeneration were identified by the Energy Sectoral Group. *NB Power will explore such cogeneration opportunities with industry, as well as any restraints that prevent development. In support of this thrust there will be an immediate cogeneration supply analysis in the industrial sector to aid in planning for new electricity supplies.*

5.4 Electricity

The pervasive nature of electricity and increasing electrification of the province warrants its separate examination for energy efficiency and conservation potential.

Since 1973, electricity requirements in OECD countries have grown by almost 50%, partly as a result of government policies encouraging energy substitution, while oil demand has remained roughly constant. In Canada, electricity is the only principal space heating form of energy to show sustained growth through the 1980's and is currently used as the primary heating source in over 50% of New Brunswick's homes. By end use, electricity in New Brunswick accounts for about 22% of energy demand. The 1989 demand projections of NB Power show continued load growths of about 2.9% to the year 2004. Electricity, as such, is a key to energy efficiency and conservation in the province.

There are changes taking place in the utility sector, throughout OECD countries, which relate to the efficiency of electricity end-use. These changes find point of reference in the context of demand side management (DSM). Under a DSM scenario energy conserved by a customer is an energy resource to be treated no differently by a utility than water in a river or coal in the ground. The so called conservation resource must be studied as would any other resource, to identify what it will yield and how dependable and reliable will be its supply. Therein lies the challenge for the utility. The utility must consider how much of its ratepayers money is it willing to invest in DSM compared to traditional supply side resources.

There are those that advocate increasing electricity rates to reduce demand. While this may be a viable option the province has to give careful consideration to consumers such as low income families and those on special assistance. A heating allowance, for example, is a key component of the shelter cost formula for social housing programs. A second concern is that many small businesses operate on low profit margins with electricity costs a major concern. Although any electricity rate structure is a definite factor in energy use, any changes must be applied with care and attention to consumers.

As early as the 1960's NB Power had people in the field advising customers how energy could be saved in new housing. NB Power administered and delivered the province's Home Energy Conservation Loan Program (HECL) in the 1970's and participated in the Canada/New Brunswick Steering Committee on Energy Conservation. NB Power also delivered the Canada Oil Substitution Program (COSPP). All the while NB Power people were advising customers on how to conserve energy. Nowhere was this more apparent than

in the massive aerial thermography program mounted by NB power in the early 80's. Forty thousand New Brunswickers were shown the heat being lost from their residence. The continued mention of this program by customers, indicates its lasting impression. The remainder of the 80's saw several new programs including the Conservation and Electrical Improvement Loan (CEIL) which replaced both the province's HECL and NB Power's wiring improvement program. NB power promoted heat pump technology to industry, co-sponsored three heat pump seminars and late in 1989 announced its commitment to the University of Moncton of \$300,000 for the study of advanced heat pumps.

The 1990's saw an increased interest in customer service and advice. This culminated in the introduction of the "Home Energy Check" program. HEC had a two fold purpose; firstly to provide customers with whole house energy audit and secondly to provide NB Power with a data base on housing conditions in the province. Residential customers as well as municipal facilities were studied to determine their potential for conservation. NB Power also embarked on an energy efficient incandescent lighting rebate program featuring the compact krypton light bulb. The primary purpose of this program was to increase the awareness of customers to new energy efficient technologies. A program was put into place to change all NB Power-rented mercury vapour outdoor lighting to more efficient high pressure sodium lighting.

Under the new energy policy, NB Power will look at energy efficiency and conservation as a strategic resource whereby specific measures will compete with supply-side alternatives in economic analyses.

Programs will be designed and implemented in the residential, commercial, and industrial classifications which will result in net dollar savings compared to the addition of new generating plants.

Demand-side management (DSM) and cogeneration will play a major role in NB Power's capacity planning for future load growth. A capacity reduction target will be established upon completion of a detailed analysis of the energy efficiency potential.

5.5 Government Facilities

Working on the premise that government should lead by example, the Department of Natural Resources and Energy initiated a Provincial Energy Management Program in August 1988 with the primary goal of improving energy use in provincially owned buildings.

The program consists of setup, reporting, audit, efficiency improvement, and monitoring phases.

The setup phase was a one time process that was required to establish the monitoring phase and to provide initial evaluation of the program potential. The resulting energy profile for fiscal year 1987-88 revealed a total recorded consumption of 787 million kWh at

a cost of 33 million dollars, in 1,041 facilities. Subsequent analyses suggests that the potential for improved efficiency and conservation is 95 million kWh or 3.7 million dollars annually.

The reporting phase represents the mechanism of disseminating information to building managers with respect to energy performance. Annual reports are prepared indicating the dollars and energy avoided through improved energy efficiency and conservation. The reports are department and building specific.

Evaluation of energy consumption can pinpoint buildings that are in need of improvements but cannot define the building's problem. The objective of an Energy Audit Phase is to identify the problem so that a solution can be formulated. The audit is a systematic approach of defining the current energy situation and identifying the potential energy efficiency and conservation opportunities that exist. Once the audit is completed priorities can be set by calculating the payback periods for each respective measure. The audit becomes an essential tool in formulating an efficiency improvement plan for each site.

The efficiency and conservation improvement phase involves the actual implementation of the efficiency measures and is the responsibility of each department or district. Given the information from the previous phases the energy manager should be in a position to make an informed decision. It is the role of this program to provide the support and motivation needed to assist in the process of implementation.

The monitoring phase represents the ongoing collection and evaluation of energy use, with the purpose of measuring the success of the program. Success is measured in primary terms of avoided energy use and dollars spent. Monitoring also offers many other features such as, discovering billing errors, evaluating electric rate code changes, highlighting abnormal monthly consumption, budgeting, and the preparation of energy related reports.

With government building management falling under the purview of several government departments it is important that the management of energy use be coordinated by one central group without any vested interest in any one energy form. This is currently carried out under the auspices of the Department of Natural Resources and Energy.

The government will continue the present energy management program to enable it to expand into the energy auditing phase. A total of 412 buildings have been targeted to receive audits.

Examination will be made of financial incentives so as to reward energy efficiency and conservation gains such as those by a department, school board or hospital.

Energy efficiency and conservation will be viewed as an investment with a rate of return that includes the added benefits of reducing emissions, lower operating costs, increased occupancy comfort, and improved building systems.

Innovative financing approaches to energy efficiency and conservation are required which facilitate implementation of measures. Energy Service Companies are one such vehicle which may offer such an approach.

Specific Measure Opportunities include:

- ▶ Re-lamping to 35 watt tubes as fluorescent tubes are replaced;
- ▶ Installation of oil flow meters and combustion testing on oil-fired units;
- ▶ Demonstration of the merits of energy performance contracting by application to a high-profile government building;
- ▶ Central tendering of light fuel oil; and
- ▶ Normalized billing system between NB Power and all government departments and agencies.

5.6 Transportation

The transportation sector consumed 25% of the total 1989 consumption (Figure 8, page 37) or about 55 petajoules (9.6 million barrels).

Road transport is of particular concern since its consumption accounts for over 80% of oil consumed in the transport sector. It is also a high priority target for environmental protection efforts since it contributes substantially to air quality problems, acid rain and global climate change.

The province will ask the federal government to examine its rail transportation policy, particularly with respect to the environmental advantages of lower atmospheric emissions, compared to road transportation.

Significant improvements were made in fuel efficiency gains in new passenger motor vehicles over the period 1973 to 1986 particularly in the United States, Germany and Japan. The rate of improvement in new fuel efficiency declined after 1983 with the trend reversing in Japan in 1984. The reasons often given include increasing cost of incremental fuel efficiency improvements, reduced economic incentives due to lower fuel prices and the growing market share of larger and high performance cars.

The average efficiency of new cars for 1990, in the United States, is set at 8.5 litres/100 Kilometres. A study by the U.S. Department of Energy puts the efficiency figure for 1995 at 7.5 litre/100 kilometres when taking into consideration consumer willingness to pay for increased fuel economy.

Canadian average fuel consumption standards set by Transport Canada for 1991 but voluntary in nature are:

- 8.1 Litre/100 Km for passenger vehicles
- 10.6 Litre/100 Km for two wheel drive vehicles
- 11.4 Litre/100 Km for four wheel drive vehicles

New Brunswick has very limited potential for reduced fuel use because of fleet size and dispersed population. The province is generally the recipient of vehicle manufacturing policies made in Central Canada or the United States and can do little but play an advocacy role in vehicle efficiency.

Despite its limited potential to act independently of the large automotive industry centred elsewhere in North America, *the province will develop fuel efficiency targets for the provincial vehicle fleet.* Current weighted provincial vehicle fleet efficiency for 1989/90 is 17 Litre/100 Km. A target to improve this fleet efficiency by 25% to 13 Litre/100 Km by 1995 is achievable and attainable through the normal vehicle stock turnover.

The province will be examining a number of measures to improve vehicle fuel efficiency and public driving attitudes:

- ▶ Pricing and tax structures for different fuels and vehicles to encourage efficiency and conservation;
- ▶ Promote use of public transport in such cities as Saint John, Moncton and Fredericton and intra and inter provincial travel with regional carriers;
- ▶ Intermodal freight transport;
- ▶ Adoption of fuel emission standards related to energy efficiency;
- ▶ Promotion of energy efficiency and conservation driving habits in the trucking industry and with passenger vehicles. Such programs as "ProTrucker" and "ProFisher" promoting fuel efficiencies in the trucking and fishing industries respectively will be promoted.

The "ProTrucker" Program delivered in cooperation with the federal and provincial governments of Quebec, Manitoba, Newfoundland and the Maritimes has shown significant fuel efficiency gains. Analysis prepared for Energy, Mines and Resources Canada showed the average yearly travelled distance reported by drivers, participating in the program, was 100,000 Km with an average fuel consumption of 46 litres/100 Km or 46,500 litres per annum. Annual fuel savings per driver were 8100 litres or about 14%.

New Brunswick has not participated for the last two years, but a lower key program has continued through the cooperation of the federal and other Maritime governments.

Starting in 1991, New Brunswick will again participate fully with other provinces and the federal government in the "ProTrucker" program to promote fuel efficiency in the trucking industry. The province will also promote increased awareness of fuel efficiency and the environmental benefits.

5.7 Summary of Measures

- ▶ Immediate analysis, in 1991, of the energy efficiency and conservation potential in all sectors for all energy forms leading to the development of a dynamic framework featuring target setting, monitoring, and environmental impact capabilities;
- ▶ Analysis of historic energy supply/demand and projection of future needs beginning in 1991 with regular updating;
- ▶ In consultation with stakeholders, develop Performance Standards for buildings, appliances and other energy consuming equipment. This is to include:
 - (i) Product labelling through cooperation with the federal government in an updated "Energide" labelling program;
 - (ii) Energy Efficiency legislation providing for minimum levels for energy efficiency of major household appliances;
 - (iii) Work in cooperation with Energy, Mines and Resources Canada and the National Research Council to update energy efficiency and conservation measures for inclusion in the National Building Code. This would to be followed by assessment of impacts of implementing the National Building Code in New Brunswick with particular regard to impacts on lower income groups and ways and means to mitigate hardships; and
 - (iv) Work cooperatively with the New Brunswick home building sector to promote energy efficiency and conservation in both new and existing building stock.
- ▶ Demand-Side Management (D.S.M.) to be considered on a equivalent basis in NB Power's capacity planning process with avoided cost pricing comparisons.
- ▶ Thorough review of electricity rate structures to encourage energy efficiency and conservation. Such review to include such issues as marginal costs, peak load pricing and declining block rate structures and be especially sensitive to low income groups;
- ▶ Public Utilities Board to review NB Power's "buy back" rates for independent power producers.

- ▶ In cooperation with industry, identify all opportunities for cogeneration in New Brunswick with it having a high priority in plans for new capacity electricity generation.
- ▶ Work cooperatively with industry and the universities to identify Research and Development for energy efficiency and conservation;
- ▶ Design and evaluation of energy efficiency and conservation programs and initiatives on a cooperative basis with federal and municipal governments;
- ▶ Pursue a cost-shared federal-provincial Energy Agreement with a strong emphasis on R and D; demonstrations, technology transfer and feasibility studies for increased energy efficiency and conservation in all sectors of the provincial economy;
- ▶ Promote increased public education and awareness of energy use and the environment-economic interrelationships;
- ▶ Government energy management program for buildings and vehicle fleet. This to include:
 - (i) 25% improvement in vehicle fleet fuel efficiency by 1995;
 - (ii) Monitoring of energy use in all government owned buildings with the objective of encouraging increased efficiency and conservation, such as the identification of potential opportunities and target setting;
 - (iii) Immediate evaluation of the potential for energy performance contracting in government buildings starting with a pilot project on a high profile facility; and
 - (iv) Review of space heating requirements in present and new buildings which will include installed capital cost and projected life cycle operating costs.
- ▶ Establish an Energy Advisory Service to residential, commercial/institutional and small industry under the auspices of the Department of Natural Resources and Energy. Such a service to include a toll free telephone line. This service will coordinate with NB Power's existing "Home Energy Check" program.
- ▶ Work with municipal transit authorities to examine ways and means of increasing urban ridership. Such examination to involve possible changes in infrastructure to reduce carbon dioxide through efficiency.
- ▶ Participation in fuel efficiency programs with New Brunswick's trucking industry.



6.0 Energy Supply and Demand

The New Brunswick economy has, to a large extent, been built on an adequate, stable, secure and reasonably priced energy supply. With an economy that is heavily dependent upon the resources sector it is of fundamental importance that energy costs remain competitive and that supplies are available to maintain economic growth.

Nevertheless, the new environmental awareness has raised the question of whether current pricing policies for energy sufficiently consider the true cost, including the environment, in energy production and consumption. Clearly as prices increase to accommodate environmental costs, the best way of retaining lower energy inputs is through energy efficiency and conservation. However, this alone will not meet the province's energy needs for the next decade and must therefore be pursued jointly with planning for additional supply.

New Brunswick's energy consumption by primary energy source in 1989 was 222 petajoules (36 Million BOE) with the two predominant forms being crude oil (62%) and wood (25%) (Figure 6). When considered in terms of end use it can again be seen that refined petroleum products (RPP's) at 52% and wood and wood residue at 25% dominate consumption (Figure 7). Electricity provides 22% by end use form, but must be considered as in a 100% efficiency form compared to lower efficiencies for oil products and wood.

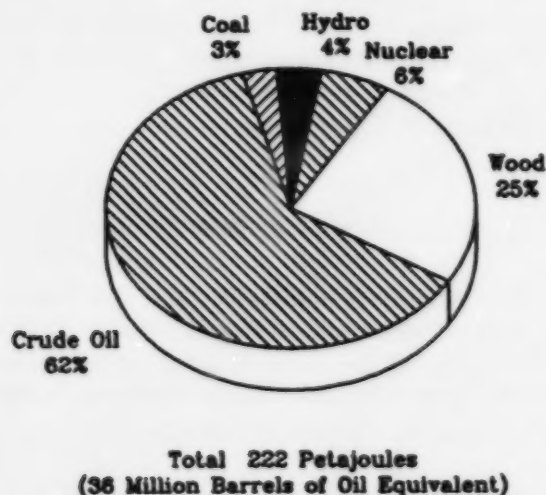


Figure 6 Energy Consumption by Primary Energy Source, 1989.

Note: Includes producers use. Source: Stats. Can. #57-003, 1989 Q4

1989 figures for energy consumption by sector (Figure 8) show the dominance of industrial use at about 50% followed by transportation at 25%. This reflects the heavily resource base industries which form the backbone of the provincial economy and are large

consumers of energy. A breakdown of industrial energy use shows wood at 40%, refined petroleum products at 37% and electricity at 22%.

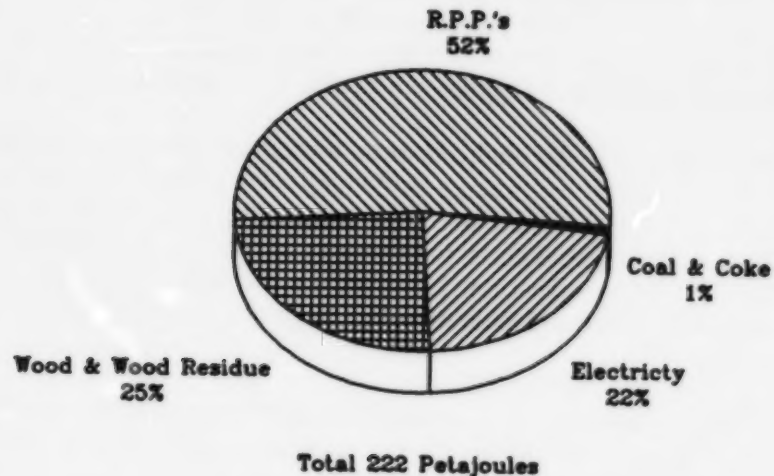


Figure 7 Energy Consumption by End Use Energy Form, 1989

Note: Includes producers use. Source: Stats. Can. Cat. #57-003 1989 Q4.

Fundamental to planning for the future of all forms of energy needs of New Brunswick is an analysis of historical patterns and forecasting of supply and demand. Such forecasting requires the cooperation and input from all levels of government, their agencies, industry and other stakeholder's groups.

6.1 Reliability and Security of Supply

Reliability relates to energy availability in a usable and consistent form and involves distribution infrastructures, whereas security of supply relates both to physical supplies and price shocks. Concerning price effects, security of supply means protection of the economy from sudden sharp increases in prices which, in the past, have radically altered terms of trade and reduced national and provincial income.

In terms of physical availability, security of oil supply means adequate assurance that, in an emergency, sufficient oil supplies are obtainable by all New Brunswickers to maintain acceptable levels of economic activity, essential services, comfort and mobility.

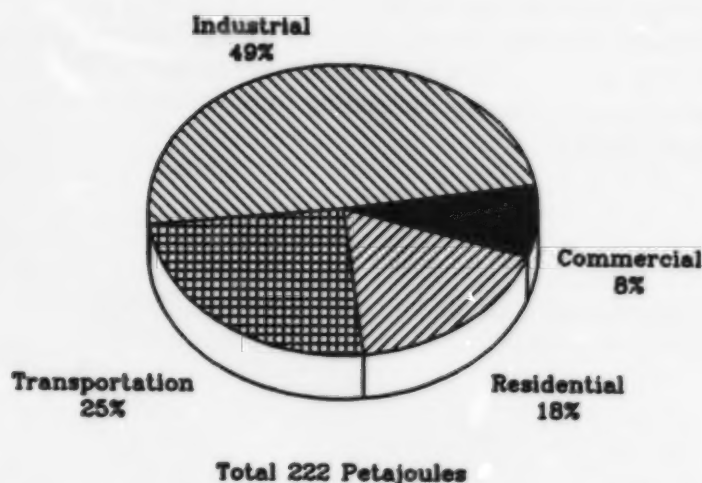


Figure 8 Total Energy Consumption by Sector, 1989. Note: Includes producer's use. Source: Stats. Can. #57-003 1989 Q4.

In recent years both industry and business have become more and more reliant on electrotechnologies and electricity. Office systems involve computers, disc drives, modems, fax machines, photo copiers and telephone systems that are totally dependent on a reliable supply of electricity. Residences contain an ever-increasing range of products which are electrically powered and controlled. The dependence of industry and commerce on electrotechnologies has made the reliability of the electrical supply of paramount importance. This can be demonstrated by a two-second power interruption at an automobile plant in Ontario which caused the company to scrap an entire assembly line of 15 automobiles.

Since 1950 there have been six disruptions in world oil supplies, all originating in the Middle East. Most were of short duration but the 1973 and 1979 disruptions had widespread effects including huge price increases which contributed to economic recessions. The 1990 Persian Gulf situation resulting from Iraq's invasion of Kuwait and the U.N. embargo on crude oil from both countries has again put tremendous upward pressures on crude oil prices. If these high prices continue for several months they will again fuel inflation and add to an economic downturn.

New Brunswick and the rest of Atlantic Canada are dependent upon imported crude oil, as well as heavy fuel oil, for electricity generation. Imports of crude oil and refined petroleum products totalled in excess 50 million barrels in 1989 with part being dedicated for export.

New Brunswick, like the rest of Atlantic Canada, does not have access to Western Canada supplies of crude oil or natural gas as the pipeline for each terminate in Montreal and Quebec City respectively.

Imports of crude oil and refined petroleum products into New Brunswick during 1989 were all drawn from offshore sources (Figure 9). With crude oil supplying 62% of the provincial primary energy source in 1989 New Brunswick remains vulnerable to possible supply disruptions, including any emanating from escalation of the current Persian Gulf situation.

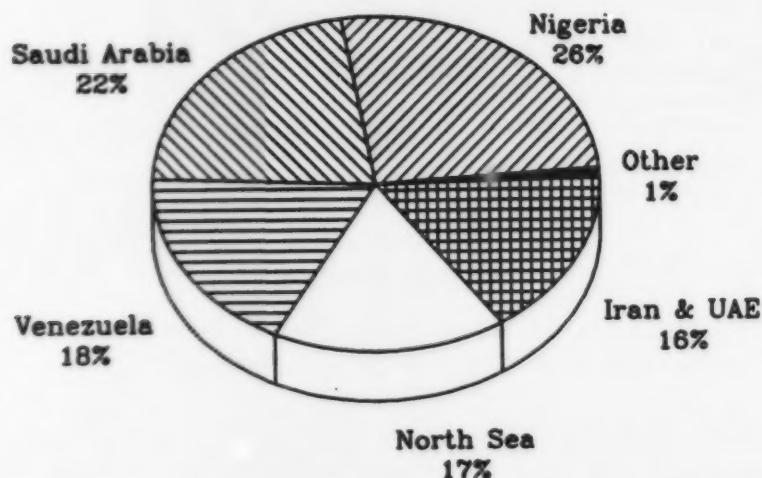


Figure 9 Estimated Total Imports of Crude Oil and Refined Petroleum Products by Country, 1989. Source: N.B. Statistics.

In terms of oil security New Brunswick relies heavily on the federal government through its membership in the International Energy Agency (IEA) and the emergency oil sharing system. In the event of a prolonged oil shortage, triggering an IEA sharing action, Canada would likely be in a net "sharing" position with other IEA countries. Therefore to ensure an equitable reallocation of available domestic supplies throughout Canada the federal government could invoke the Energy Supplies Emergency Act and the Energy Supplies Allocation Board (ESAB). With no Strategic Petroleum Reserve in Atlantic Canada there would be a need to move oil supplies over existing pipelines and by tanker.

New Brunswick will develop a contingency plan for oil shortages in cooperation with the Energy Supplies Allocation Board (ESAB). It will cooperate fully with the Demand-Restraint Subcommittee of the Interprovincial Advisory Committee on Energy (IPACE) to identify ways and means of reducing dependency on crude oil and refined petroleum products.

Security of electricity supply, aside from a 30% dependence on oil-fired units, is predominantly aided by adequate reserve capacity on NB Power's system and the interconnections with neighbouring utilities.

Interconnections which began more than 30 years ago as a means of mutual assistance during emergencies, are today major economic links. New Brunswick had

interconnections totalling over 2,300 MW - Quebec (1,000 MW), New England (800 MW), Nova Scotia (400 MW) and P.E.I. (100 MW). This creates an interconnection capacity comparable to 2500 MW of in-province peak demand.

6.2 Projected Energy Needs

New Brunswick's energy demand projections together with historical data from 1973 are shown in Figure 10. Here there is clear evidence of the economic impacts of higher oil prices in 1973 and 1979 and the resultant economic slowdowns. The energy efficiency and conservation programs also contributed to reduced energy demand in the subsequent years. It also shows that consumption only returned to 1980 levels by 1989.

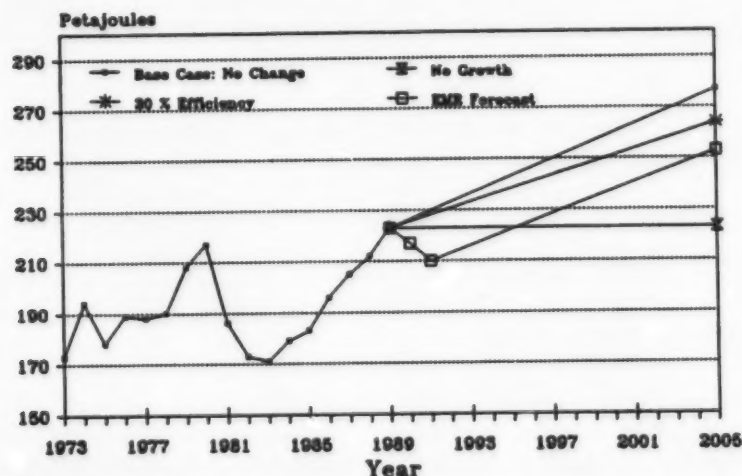


Figure 10 Forecast of Energy Demand to 2005. Source: EMR, IFSD Model, Stats. Can. #57-003, 1989 Q4.

Despite the fact that energy consumption only reaching the 1980 level in 1989, there was a considerable move to a more intense electricity consuming society. Thus electricity sales and supply grew steadily from about 5.5 billion kWh in 1974 to about 12.4 billion kWh in 1989, at the expense of switching off oil. Residential sales per customer grew from 6,000 kWh in 1973 to about 15,000 kWh's in 1989.

Projection of energy demand for 1989 to 2005 are given under four scenarios:

- (i) Base Case;
- (ii) Assumed 20% energy efficiency and conservation on the Base Case;
- (iii) No growth on 1989 level; and
- (iv) 1990 forecast of Energy, Mines and Resources Canada

The "Base Case" forecast results in a 30% increase in energy use and is based upon the Interfuel Substitution Demand (IFSD) model of Energy, Mines and Resources Canada and Stats. Canada data for 1989, together with NB Power's electricity load forecast. NB Power's 1989 Load Forecast shows the province's electrical energy requirements to increase by 54% by 2004; this reflects an average increase of 2.9% per year.

The "20% efficiency and conservation" case assumes the scenario that the province can reduce energy consumption growth by 20% through energy efficiency and conservation measures. It must be emphasized that detailed analysis is required to confirm such a saving and that the savings would vary from sector to sector and with energy form.

The "EMR forecast" is the latest projections from Energy, Mines and Resources Canada showing the most likely consumption pattern with reduced energy demand for the 1990/91 and 1991/92 period due to economic slow down and increased crude costs. *Annual growth in energy demand is then forecasted to average 1.3% or a 15% increase over the 1989 level.*

With the exception of the unlikely scenario of no growth, all the scenarios demonstrate a need for additional energy supply within the next 15 years.

6.3 Energy Supply

6.3.1 Indigenous Fuels

Coal

New Brunswick has 20 million tonnes of proven coal reserves in the Grand Lake and Beersville coalfields. There is also a resource potential of a further 20 million tonnes which could be surface mined. The coal, which has a characteristically high sulphur content (6 -8%), occurs in seams with an average thickness of 0.5 m. or less. These thin seams result in a high stripping ratio where it is not uncommon in the Minto/Chipman area for it to be greater than 60:1. Thus on average more than 30 m. of material has to be removed to expose 0.5 m. of coal. In most coal producing parts of the world the strip ratio is 10:1 or less.

New Brunswick's annual coal production is currently in the 525,000 - 550,000 tonne range and it is utilized completely by NB Power at the Grand Lake and Dalhousie generating stations. Work continues in order to determine the development potential of the Beersville, Kent County deposit. This work will involve drilling to determine seam thickness and continuity as well as digging a test pit to determine mining characteristics, pit floor conditions and acid mine water generation potential. The work will verify seam characteristics, coal quality and determine whether the deposit can be mined economically and in an environmentally acceptable manner.

Oil Shale

Estimates indicate that New Brunswick's oil shales contain 3 billion barrels of oil "in place" in beds yielding greater than 50 litres of oil per tonne of rock. Present oil prices and technology preclude the economic development of these oil shales. The province continues to encourage exploration and research on technologies which may lead to future development.

Wood

Wood contributes a significant proportion of New Brunswick's primary energy supply and totalled 25% or 55 petajoules in 1989. Total consumption in primary energy form was 3.4 million bone dry tonnes (BDT's) in 1989 including wood residue, spent pulping liquor and round wood (Table II).

Table II

Wood and Wood Residue Consumption, 1989

Sector	B.D.T.'s	Terajoules
Commercial/Institutional	61,000	1,316
Residential	583,000	10,815
Industrial - wood residue	1,069,000	19,842
- Spent pulping liquor	<u>1,696,000</u>	<u>23,741</u>
TOTAL	3,409,000	55,714

Source: Stats Canada #57-003 1989 Q.4, DNRE Unpublished Data.

A 1989 survey of fuelwood consumption in the residential sector showed that during the 1989/90 heating season, 51% of New Brunswick households used wood as a primary or secondary source of heat. A total of 492,000 cords were consumed with an average of 4 cords per household.

Only small quantities of forest harvesting residues are presently being processed into chips and used as fuel. Recent studies indicate that a sustainable annual supply of wood residues amounts to approximately 3 million BDT's. Considering the economics of conversion of existing oil consuming facilities, and of new wood fuelled facilities to wood residue, the projected total annual use of wood and wood residue could exceed 2 million BDT's by the year 2005.

The pulp and paper industry consumes the bulk of the wood residue and all of the spent pulping liquor. Following the 1979 oil price increase many institutions installed wood-fired boilers, thereby demonstrating the viability of using wood residue on a smaller scale.

In 1990, the Department of Natural Resources and Energy called for bids for the private sector to build, own and operate a nominal 25 MW wood-fired power generation plant at Sussex. Two bids were received with proposed revenue requirements ranging from 12 to 17¢/kWh (1994 \$'s) this would have required a substantial government subsidy over the NB Power "avoided cost" therefore causing government to reject both bids.

Despite this, government believes that there are further opportunities for use of wood and wood-residue for energy but that its use as a fuel for electricity generation must be in the form of cogeneration, thereby creating much improved efficiencies.

Government will explore all opportunities for expanded use of wood and wood-residue, particularly for cogeneration. This expanded use must, however, continue to recognize the province's limited resources and the priority for "added value" products.

6.3.2 External Fuels

Crude Oil and Refined Petroleum Products:

Crude oil continues to dominate New Brunswick's energy consumption by primary energy source as evidenced by the 1989 data which showed it at the 62% level. This dominance as an energy source continues despite the gains made in wood and wood-residue by industry and the start-up of the Lepreau I nuclear unit, since 1979.

Crude oil also continues to act as the reference price for all other energy commodities as has been evidenced by the current Persian Gulf situation and the rapid escalation in oil prices.

Part of the reason for oil's continued domination is its use in the transportation sector. This is further compounded by the increase in freight movement by truck at the expense of the railways and by the province's limited mass transit systems.

Consumption of refined petroleum products by sector for 1989 are shown in Figure 11. Clearly transportation and electricity generation are the major consumers, totalling close to 70%. Consumption by end use fuel for 1989 is shown in Figure 12.

New Brunswick's crude oil supplies are all imported from offshore sources and thus vulnerable to supply disruptions. Access to western supplies of crude oil via

pipeline are limited to Montreal, Quebec. Furthermore, western supplies of light crude oil are diminishing and being replaced by heavy crudes and synthetics.

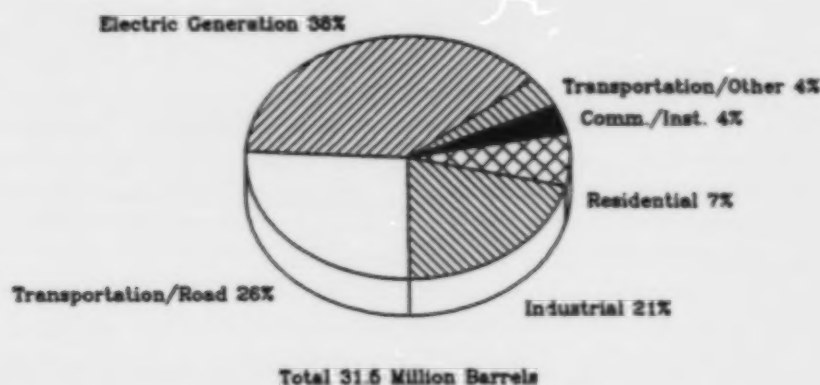


Figure 11 Refined Petroleum Products Consumption by Sector, 1989.

Note: Includes electrical generation. Source: Stats. Can. #57-003, 1989 Q4.

The largest refinery in Canada of capacity 39,7000 M³/day (250,000 bbls/day) is located in Saint John, refining imported crude and supplying products to Atlantic Canada, Quebec and parts of New England. Other petroleum products are brought into New Brunswick from refineries in Quebec and Nova Scotia with oil companies maintaining a number of bulk storage plants. Product is generally moved by truck transport although some coastal transport by barge exists.

Natural Gas

New Brunswick does not have access to natural gas as the pipeline transporting western natural gas east, terminates in Quebec City. In addition, the potential for natural gas off the east coast remains undeveloped.

Without access to natural gas New Brunswick remains limited in the responses and options it can pursue to the environmental pressures associated with acid gas emissions and fuel supply options to reduce crude oil dependency. With access to natural gas the province would have what is cited as the international fuel of choice and the least benign of all the fossil fuels. The Watt Committee on Energy in the United Kingdom has stated that "probably the greatest potential to reducing CO₂ emissions in the short-term in energy conversion lies in the installation of natural gas-fired turbines for industrial combined heat and power and high efficiency combined-cycle electricity generation".

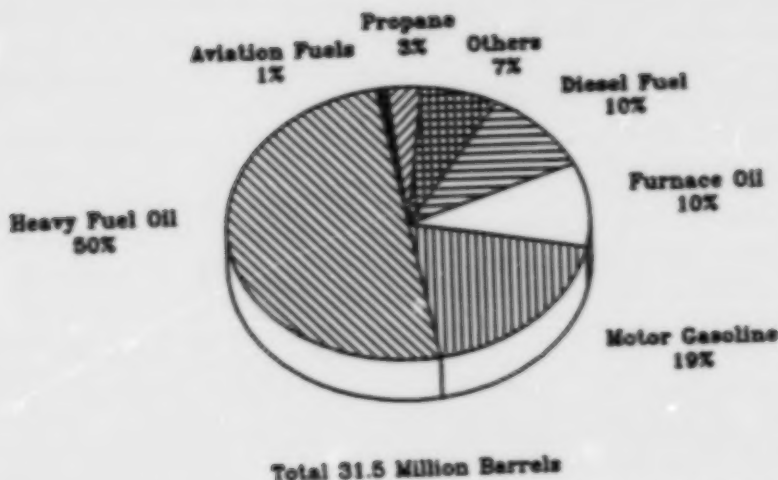


Figure 12 Refined Petroleum Products Consumption by End Use Fuel, 1989. Note: Includes electricity generation. Source: Stats. Can. #57-003, 1989 Q4.

In 1980 the federal government accepted the National Energy Board recommendation to extend the natural gas pipeline system beyond Montreal to Lévis/Lauzon, Quebec with laterals and sub-laterals. Subsequently the pipeline was extended to more outlying areas such as the Saguenay, Lac St. Jean region of Quebec and more recently to Vancouver Island.

Despite the activities of the early 1980's the Maritime provinces remain without access to natural gas. Therefore, in 1989, New Brunswick, working in conjunction with TransCanada Pipelines Ltd. and Gazoduc TQM, examined the extension of the pipeline from Quebec City (north shore of the St. Lawrence River) to Edmundston in New Brunswick and then via the north shore through to Newcastle. The target markets were large industrial customers (pulp mills and mine/smelter operations), and power generation although expansion into the commercial/institutional and residential markets could follow at some future date.

Preliminary estimated capital cost for the 610 Km. pipeline was \$462 million (1989 \$) based upon a single pipeline, 508 mm. diameter. In addition, it was estimated that expansion on the existing TransCanada/TQM system would cost an additional \$344 million for a total of \$806 million (1989 \$).

Subsequent to examination of the northerly pipeline route, New Brunswick has also looked at a southerly route to Saint John, following a similar route to that in the original 1980 TQM application to the NEB. The actual distance would be similar to the 610 kilometre northerly route.

1989 also saw the application by TransCanada Pipelines Ltd. to the National Energy Board for their 1991/92 facilities application and associated export licences. This application for pipeline expansion to move Canadian gas to both expanding domestic and export markets involves construction of 1592 kilometres of pipeline, installation of 21 new compressor units and two new compressor stations at an estimated cost of \$2.6 billion (1989 \$).

The size of this expansion and the target markets, with 75% going to the Northeastern United States, caused considerable discussion at the National Energy Board Hearing (GH-5-89) particularly centred on tolling methodologies and financial risk. The National Energy Board (NEB) recently brought down its decision that all facilities approved for TransCanada's 1991/92 expansion program would be rolled into TransCanada's rate base for toll purposes, thereby rejecting arguments that favoured incremental tolls on any part thereof. The Board decision in effect means that all shippers on TransCanada's pipeline system will share the costs of the 1991/92 expansion project. Amongst other reasons for its decision, the Board found that it was the aggregate demand of all shippers that gave rise to the need for additional pipeline capacity. Although this was not a generic decision the Board did indicate that there would have to be a clear demonstration of radically changed circumstances before the issue of tolling methodology would warrant re-examination. Had the Board ruled in favour of incremental tolls it could have seriously impacted on the potential for extending the natural gas pipeline into New Brunswick.

At the August 1990 meeting in Winnipeg, Manitoba, provincial and territorial Energy Ministers endorsed the principle of extending the natural gas pipeline into the Atlantic Region, seeing it as an example of a national priority within the context of national energy transmission facilities. They saw it requiring strong federal government support to diversify energy supplies.

New Brunswick believes that access to natural gas is of extreme importance to provide for additional fossil fuel security from crude oil. It also offers access to the most environmentally benign fossil fuel thereby aiding in an atmospheric reduction strategy, and provides an alternative fuel to compete with rapidly escalating crude oil prices. Therefore, access to natural gas for New Brunswick will be the second major thrust of this energy policy after energy efficiency and conservation and the province will pursue the pipeline extension with the federal government.

6.3.3 Electricity

The supply of electricity in New Brunswick is generated from a variety of indigenous and imported fuel supplies feeding generating stations located throughout the province. This supply is further supplemented through interconnections with neighbouring provincial and U.S. state utilities. NB Power's present generating capacity consists of 3228 MW from a total of 46 units at 14 locations. (Table III and Figure 13)

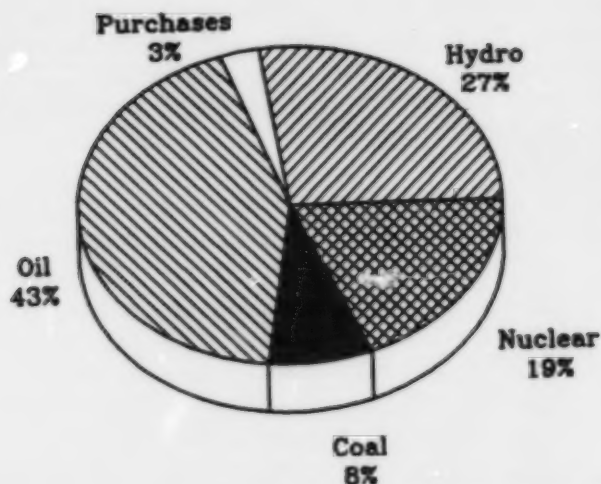


Figure 13 Electricity Generation Capacity by Type, 1990.

Hydro

NB Power's electrical generating system is a combination of hydro, thermal, and nuclear, each of which meets baseload or peak (high) electrical demand. Hydro stations normally handle the peak load demand, thus their importance to the system is critical. Hydro uses falling water to generate electricity and is one of the most common and economical ways to supply energy. It also offers operational and environmental advantages over other production facilities. NB Power's current hydro supply consists of six generating stations, the largest being Mactaquac with installed capacity of 653 MW (the energy equivalent of 2.35 million barrels of oil annually). The other plants are Beechwood (115 MW), Grand Falls (63 MW), Tobique (20 MW), Sisson (10 MW), and Milltown (4 MW).

Future expansion of hydro is limited since New Brunswick is not endowed with major water storage capacity on its river systems. Two possibilities include a 300 MW expansion at Grand Falls and a 140 MW development downstream at Morrell but these could not be economically realized until after the year 2000 in the absence of export markets. Hydro helps to reduce the province's reliance on offshore oil, as an indigenous resource, and will continue to play a complementary role in meeting peak electrical demands in New Brunswick.

Fossil Fuels

Oil - Oil came into common use as the preferred fuel for thermal generation beginning in the late 1960's. It was cheaper than coal, burned cleaner and was easier to transport. The 1973 and 1979 energy crisis changed all that and New Brunswick was faced with significant price increases as well as a serious threat to disruptions in supply.

Despite the fact that initiatives have already been taken, oil-fired thermal generation still represents 43% of NB Power's electric generating capacity. *A policy of offsetting oil use with more stably priced and secure alternative fuel supplies will continue.*

Imported Coal - High grade coal from world sources is in abundant supply and New Brunswick's strategic geographical location gives it year round marine access to markets located both in the Atlantic and Pacific trading regions. Imported coal is planned as the primary fuel for the multi-fuelled plant at Belledune.

Orimulsion - Orimulsion is an emulsified hydrocarbon product consisting of about 30% water and 70% Orinoco bitumen. Although it is a single sourced fuel (Venezuela), it has potential economic advantages in that it falls outside of OPEC pricing arrangements and is being made available at coal-related prices.

NB Power has completed an extensive demonstration program of Orimulsion fuelling, carried out in cooperation with the Venezuelan producers at its Dalhousie Generating Station. The tests proved the technical feasibility of orimulsion as a plant fuel.

Orimulsion has displayed the properties of being a potential replacement fuel for coal designed boilers. Negotiations have been completed for the long term supply of orimulsion for both units at Dalhousie. However, any conversion would require the installation of the necessary flue gas desulphurization equipment.

Domestic Coal - With the conversion of the two Dalhousie units to Orimulsion, consideration will be given to blending New Brunswick coal with imported coal and burned in the unit at Belledune which is equipped with flue gas desulphurization equipment.

A 150 MW coal fired plant remains a consideration for Grand Lake to burn coal from both Minto-Chipman and Beersville. This unit would require scrubbers or another technology to reduce atmospheric emissions.

Table III
NB Power-Electrical Generating Station Data

Location and Type	No. of Units	Capacity Megawatts (MW)
Hydro		
Mactaquac	6	653
Beechwood	3	115
Grand Falls	4	63
Tobique	2	20
Sisson	1	10
Milltown	7	4
Total Hydro	23	865
Nuclear		
Point Lepreau	1	630
Total Nuclear	1	630
Fossil Fuel		
Coleson Cove (Oil)	3	1005
Courtney Bay (Oil)	4	263
Dalhousie (Oil/Coal)	2	280
Grand Lake (Coal)	4	85
Chatham (Coal/Oil)	2	33
Moncton (Diesel)	1	25
Grand Manan (Diesel)	6	42
Total (Oil/Coal)	22	1,733
Grand Total	46	3,228

The government is currently examining a technology known as coal gasification, which appears to be a more environmentally acceptable method of using New Brunswick coal as a fuel source.

Natural Gas - Natural gas with its environmental and potential economic advantages fits with a policy of sustainable development as well as offering a more secure source of supply. Thus, as discussed in Section 5.3.2 the province will continue to explore opportunities for bringing Western Canadian natural gas into New Brunswick and will also monitor the possible development of natural gas off Nova Scotia's east coast.

Nuclear

The 630 MW CANDU Point Lepreau project was initiated in 1975 and went into service in January 1983. All phases of the project were strictly controlled by AEBC and the impact of the development on the environment and community life was closely regulated. Lepreau's performance is exemplary, evidenced by the fact that, as of June 30, 1990, Point Lepreau had the best lifetime performance among all the world's reactors over 150 MW.

It is recognized that compared to nuclear, a coal-fired plant is cheaper to build but more expensive to operate. Estimates of lifetime economics for coal and nuclear favour coal in the early years and nuclear in the long term so that the overall comparison is difficult to predict. However, nuclear plants have the environmental advantages of no air emissions.

Public perception related to the long term disposal of nuclear wastes has been a detriment to the industry. Although experts agree that spent fuel and nuclear waste can be managed with existing technology and practices, scientists continue to refine their solutions while the concept of permanent geological disposal in the Canadian Shield is subjected to a Federal Environmental Assessment and Review Office (FEARO) review.

A 450 MW CANDU 3 unit at Point Lepreau has been proposed at Atomic Energy of Canada. Construction of the first of this new generation of reactors at Point Lepreau has considerable industrial benefit potential for the province. However, agreement must be reached on cost and financial risk assignment. *The province will continue to keep the nuclear option open.*

Imports

NB Power currently has a multi-year power purchase arrangement with Hydro Québec which secures energy availability on a firm-pricing basis and which provides options for capacity purchases of up to 300 megawatts. This contract represents the equivalent of up to 25 million barrels of oil and it reduces oil price dependence as well as oil utilization. Without this firm contract, experience verifies that Hydro Québec energy would not be available for sale to New Brunswick. The current contract runs through October 1994 and provides NB Power with substantial flexibility in its development plan due to the optional nature of the quantities involved. *Multi-year power purchases, if and when available and economic, is one of the options the province will continue to use to help reduce oil price dependence and oil utilization.*

6.3.4 Non-utility Generation

Non-utility generation (NUG) is electrical generation owned and operated in New Brunswick by electricity producers other than NB Power. Non-utility generators include several pulp and paper plants who sell excess energy into the grid and small scale hydro facilities such as those at Musquash and Perth-Andover. In addition, the City of Edmundston has 2 MW of capacity which produces energy for its own consumption.

NB Power purchases energy from the several non-utility generators with the price based on NB Powers's avoided cost for generation that could otherwise be built or purchased.

Non-utility generation may involve capacity dedicated to NB Power and interconnected with province-wide transmission and distribution network. These purchases are considered to be a supply option.

Non-utility generation which supplies electricity to meet a producer's own need can be considered "load displacement" generation. In effect it displaces load which NB Power would otherwise been responsible for supplying.

"Buy-back" rates are the prices that NB Power pays for electrical capacity and energy from non-utility generators. The rate of return on investment for a NUG is directly related to the buy-back rate offered and consequently the level of non-utility development. The buy-back rate is calculated based upon the utility's avoided cost or the cost of providing the same electrical supply as that of the non-utility generator.

Non-utility generation is also very sensitive to tax treatment and particularly the accelerated write-off of specific capital costs during the early years of a non-utility generation (class 34 capital cost allowance).

In reviewing non-utility generation proposals NB Power must also have assurance that the NUG remains in operation for the duration the utility has planned, particularly where capacity is dedicated to the provincial grid. This can be achieved through escalating rates of payment or by performance bonding.

To date New Brunswick has non-utility generating capacity of 160 MW and NB Power is willing to work with industry and other proponents to ensure that these projects are integrated into overall power supply plans. Where a proposed non-utility generator and NB Power cannot reach agreement on the compensation to be paid for electrical energy generated, then either party may apply to the Public Utilities Board for a hearing to determine the fair value of the electrical energy. The Board shall also consider NB Power's cost of electrical energy from available alternatives.

The government policy will be to encourage non-utility generation and to facilitate public input into the buy-back rates for non-utility generation in New Brunswick. The government, as a matter of policy, will instruct the Public Utilities Board to review the "buy-back" rates offered by NB Power.

6.3.5 Alternate Energy

As concerns are raised over the security of supply and the unstable prices of fossil fuels and as the environmental impact associated with these fuels become more apparent, the search for alternatives is intensified. These alternative options were identified by the Energy Sectoral Group as a major thrust for sustained development, including sources such as solar, wind, tidal, biomass, and geothermal. Some of these sources currently contribute significantly to the energy sector in Canada and in New Brunswick while others hold great promise for future development as conventional supplies become more expensive to produce and to use. Most of these alternatives have the advantages of being renewable energy sources and are indigenous to the province, offering supply security and local development advantages. They also have very low environmental impacts associated with their exploitation.

In New Brunswick biomass in the form of wood is our most significant alternative to fossil fuel. As noted earlier, in 1989 wood residue fuel from forest harvesting and the wood products industry and wood fuel use in home heating represented 25% of the total energy consumption in primary form in New Brunswick. The potential remains for a substantial expansion in the use of wood for energy and is particularly attractive when used for industrial process heat and in cogeneration applications.

It is important that wood fibre be used for the highest value products and its use for energy must be viewed in this context. However, for some time to come low grade wood by-products or residues from the forest industry are expected to remain without a higher value market and will continue to be available for energy. This time frame is expected to be considerably in excess of the full life cycle of wood combustion equipment normally

accepted in industry. *The province will therefore continue to promote the expanded use of wood residues for energy while closely monitoring potential higher value markets.*

Energy-from-waste involves the controlled combustion of municipal solid waste (MSW) and the recovery of heat energy in the form of steam which can be used for space or process heat with or without electrical generation. New technologies are becoming available which present a variety of options for the treatment of MSW. These technologies, including refuse derived fuel processes, recycling, composting and controlled landfill must be thoroughly assessed in the context of waste volumes, environmental impact, economics and energy potential. *The province will work with the Solid Waste Commissions to identify such energy technologies which may have application in New Brunswick.*

Active thermal solar applications have received moderate adoption in Canada and in New Brunswick. The most economically attractive applications are for domestic hot water and swimming pool heating and factory wall systems for preheating ventilation air. A base of Canadian equipment producers has developed with assistance from federal solar energy programs and a significant export market is in place. During the 1980's the University of New Brunswick, under contract to the provincial government, developed an automated solar radiation data collection system. With this system, a data base of incident solar radiation in five locations in the province was developed over a period of five years. As the cost of conventional energy sources increases, broader application of active thermal solar technology will result and the province will have the advantage of the most extensive solar radiation information available.

Passive solar considerations in building design have not yet become the norm in Canada even though the technology has been relatively well developed and is economically attractive. As with energy efficiency and conservation, passive solar applications will now be actively promoted to receive wider adoption in the marketplace.

Thermal gradients below the ground surface in New Brunswick range from low to medium thus limiting the potential for extensive geothermal development. The thermal quality of the heat source can be improved however, through the use of heat pumps. Considerable development in heat pump applications for residential home heating has occurred in the province over the past several years. Research and development on broader applications of ground source heat pumps in the commercial and industrial sectors has commenced through the activities of the Energy Conversion Research Centre at the University of Moncton. *Indigenous and renewable energy development opportunities such as ground water heat pumps will continue to be promoted by the province.*

The province will also actively monitor the progress in alternative energies as part of the transition to sustainable development. This includes such alternatives as photovoltaic solar cells, hydrogen, tidal power, small hydro, wind, and fuel cells. Recognizing the economic benefits of technological development, New Brunswick will also initiate new developments in the alternative energy field by promoting industry and academic research and development.

6.4 End Use Consumption

6.4.1 Transportation

The transportation sector in New Brunswick accounted for 30% or 9.6 million barrels of all refined petroleum products consumed in the province in 1989 (Figure 14). This is below 10.4 million barrel consumption in 1979 but nevertheless consumption has been growing steadily since 1985. Of the total provincial energy consumption in 1989, transportation accounted for 25% or about 55 petajoules.

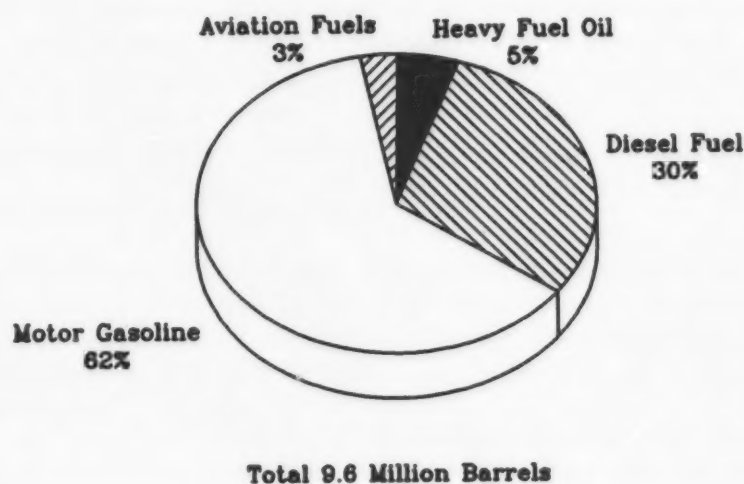


Figure 14 Total Energy Consumption, Transportation Sector, 1989.

Source: Stats. Can. #57-003, 1989 Q4.

Energy consumption by end-use or mode of transportation in 1989, shows road at 85% of the total consumption. (Figure 15) This reflects the dispersed human settlement patterns coupled with the uncertain and reduced rail service in the region.

Clearly, the motor car and vehicle freight movement continue to create mounting pressures on the province's highways. Any further reduction in rail service will exacerbate an already critically extended highway system. It would also remove a possible response strategy to "greenhouse gas" emissions and global warming.

Significant vehicle fuel efficiency gains have been made over the past decade. Despite this the transportation sector contributed 19% of the 1988 CO₂ emissions amounting to almost 4 million tonnes. It has been estimated that the average Canadian car emits about 2 tonnes of CO₂ per year, 34 kilos of hydrocarbons and about 30 kilos of nitrogen oxides.

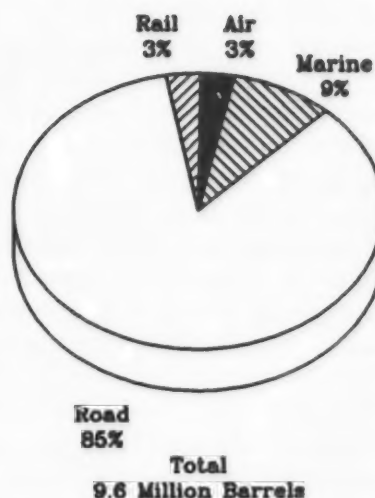


Figure 15 Total Energy Consumption, Transportation Sector, By Mode, 1989. Source: Stats. Can. #57-003, 1989 Q4.

As is discussed in Chapter 5, the average truck travels 100,000 Km per annum and has an average annual fuel consumption of 46 litres/100 Km. Through fuel efficiency promotion programs annual fuel savings of about 14% or 8000 litres were achieved. This equates to an annual reduction in CO₂ of about 20 tonnes per vehicle per year.

Urban transit systems operate in New Brunswick's three largest cities and as such contribute a significant role in reducing air pollution, energy savings and improvement in urban quality of life. Although it is not the answer to everyone's mobility needs it does play an effective response to improved air quality. *Therefore, the energy policy will promote increased use of urban transit systems in cooperation with municipal authorities.*

With the growing pressures on New Brunswick's highway system *the province will examine freight transport with a view to considering intermodal operations.* This could improve energy efficiency and conservation while at the same time ensuring acceptable freight rates to shippers and consumers alike.

The provincial government will also encourage research and development on new vehicles and fuels to increase fuel efficiency. Fuel emission and other vehicle standards under the control of the federal government which promote efficiency and conservation and environmental improvements will be encouraged.

Fuel pricing and tax structures will be examined to gauge impacts on increasing energy efficiency and conservation and savings in atmospheric emissions.

6.4.2 Other Fossil Fuel Consumption

Aside from refined petroleum product (RPP) use in the transportation sector and heavy fuel oil use for electric power generation close to 10 million barrels of RPP's were consumed in the residential (2,095 bbls), commercial/institutional (1390 bbls) and industrial (6,490 bbls) sectors in 1989.

Residential space heating requirements have changed considerably over the past decade with electricity becoming the dominant heat source, particularly in new housing construction. This has resulted in a drop in furnace oil use.

A large part of the substitution of electricity for furnace oil was driven by government programs targeted at an "off oil" policy following the 1979 oil price escalation and related to security of supply. The continued success of electricity use for space heating has been further helped by five years of no rate increases. According to NB Power their recent application for a rate increase is driven by heavy fuel oil cost increases, resulting from the current Persian Gulf situation. Similar cost increases in crude oil have been reflected in home furnace oil costs which have risen substantially.

Technological advances have brought about new high efficiency oil furnaces which help heating costs as well as improve the efficiency in oil consumption, and thereby reduce atmospheric emissions. *The government will encourage the petroleum industry to promote the installation of these high efficiency furnaces where the space heating source is furnace oil as well as promote regular furnace tune-ups.*

6.4.3 Electricity

Domestic

NB Power serves a total of 310,736 customers within New Brunswick, 271,242 of which are direct customers and the remainder of whom are served through municipal utilities in the cities of Edmundston and Saint John. Service to these customers is provided through about 31,000 km of transmission and distribution lines.

Electrical energy usage in New Brunswick has grown at an average of 5.6%/yr over the past fifteen years. Energy sales in the province totalled 11,989 Gigawatt hours in 1989-90. The division of sales by customer classification is shown in Figure 16. It is significant to note that 41% of NB Power's in-province energy sales go to large industries. The majority of these sales are for pulp and paper, refining and mining industries. Electrical energy sources to meet in-province load in 1989-90 are shown in Figure 17.

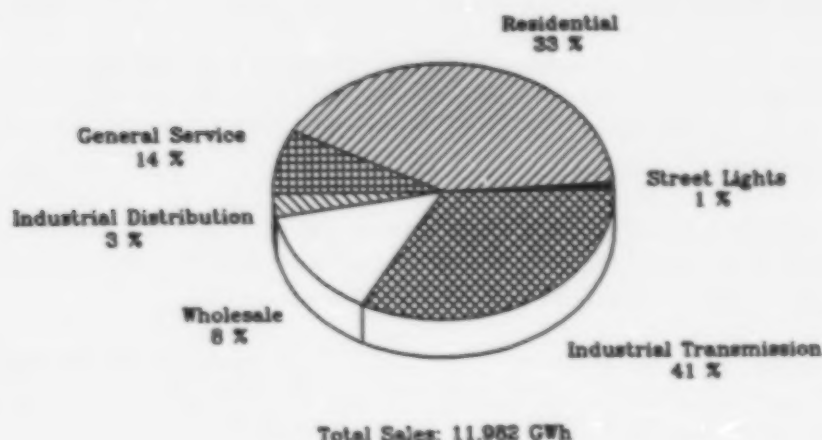


Figure 16 Electricity Sales by Customer Classification, 1989/90.

To plan a sound and reliable supply of electricity for New Brunswick, NB Power annually produces a forecast of in-province energy usage and demand requirements for the next 15 year period. This forecast is prepared each year based on a cause and effect analysis of past loads combined with data gathered through customer surveys and an assessment of economic, demographic, technological and other factors which affect the utilization of electrical energy. The process is a reactive one in that it responds to trends that society is setting in the consumption of electricity.

Electricity sales in the province can be divided into four (4) major classifications: Residential, Industrial, General Service and Wholesale. In order of rank, Industrial comprises 44% of energy utilized; Residential - 33%; General Services - 15%; and Wholesale to the two provincial municipal utilities - 8%. Industrial loads make up nearly one half of the provinces total electricity sales. In fact, of the over 310,000 customers in the province, 30 of the large industrials make up more than one third of the total provincial energy consumption.

There is a direct relationship between electrical consumption and the economy in the province. For example, when people have more income, it is spent on larger homes, more food and appliances, all which increase the consumption of electrical energy. New Brunswick's total in-province electricity sales are predicted to increase at a rate of 2.9% per year in the absence of implementation of specific demand management programs. In actual kWh terms, this growth rate is only slightly less than has been experienced over the previous 15 years during which an increase of 5.6% per year has been experienced. This means that by the year 2004 total energy sales, given present trends in the province, could be up to 54% higher than they are today. The corresponding increase in system peak demand is 80-90 MW per year. This means that over the 10 year period to the year 2000, forecasted domestic requirements will increase 800-900 MW. It is projected that the successful implementation of energy efficiency and conservation programs could reduce this quantity.

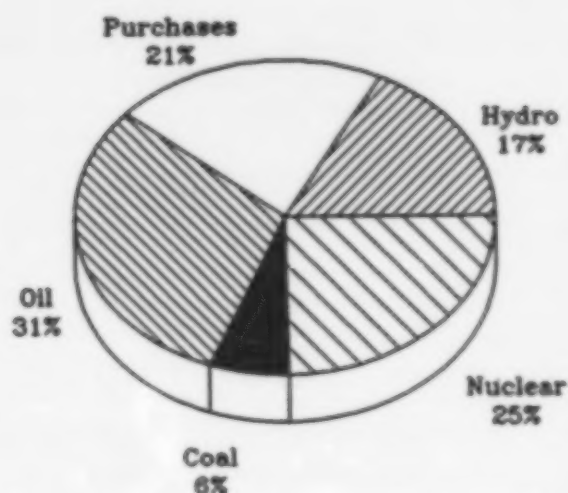


Figure 17 Electricity Supply for In Province Loads, 1989/90.

Export

New Brunswick's geographical location has allowed NB Power to pursue strategic interconnections with all neighbouring provinces and utilities in New England. Current interconnection capacity total 2310 MW. Components of this capability are:

Quebec	1000 MW
Nova Scotia	400 MW
Prince Edward Island	100 MW
New England	<u>810 MW</u>
	2310 MW

Through these inter-utility ties, NB Power has transacted hundreds of millions of dollars in purchases and sales each year. Benefits from this business have kept power rates to in-province customers 13% lower on average than would otherwise have been possible. (Figure 18)

NB Power's benefits from interconnections can be classified as tangible and intangible. The tangible benefits are manifested by reduced costs as a result of purchases and sales.

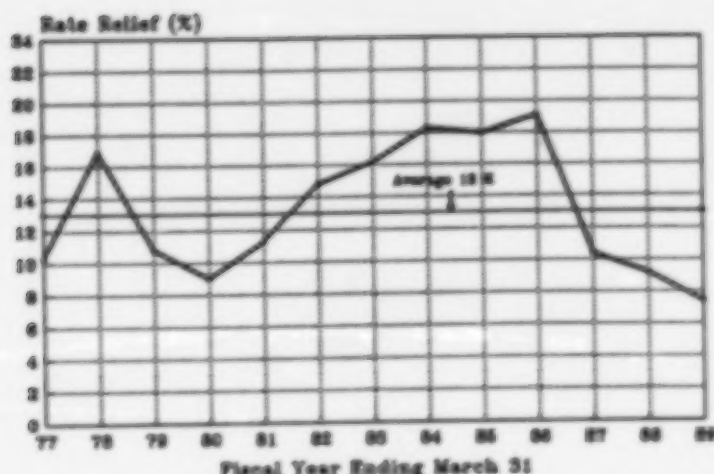


Figure 18 Benefits of Interconnection Transactions in Terms of In Province Rate Relief.

Intangible benefits include improved reliability and stability of the power system that occurs as a result of the interconnections. NB Power calls upon interconnected utilities for purchases during emergencies and extended outages of generating units. A high level of reliability is important to existing customers, as well as customers considering locating in New Brunswick. Without the interconnections NB Power would have to install additional generating capacity to meet its needs on a "stand alone" basis, or otherwise incur more power interruptions, and operate more expensive generation facilities on a standby basis. Export sales also allow NB Power to build units larger than its immediate needs to gain economics of scale, while sharing the costs of construction and the risk should the plant be delayed in completion or experience operating difficulties.

New Brunswick benefits through job creation and expenditures in various industries due to NB Power's activities related to maintaining interconnections and exporting power.

In 1989-90, NB Power exported a total of 7191 GWh of electricity resulting in revenues of \$311.5 million and benefits of \$55 million. The breakdown of external sales revenues is shown in Figure 19. External sales revenue makes up 32.5% of NB Power's total revenue, as illustrated in Figure 20. Benefits from export sales are returned to NB Power's customers through reduced rates.

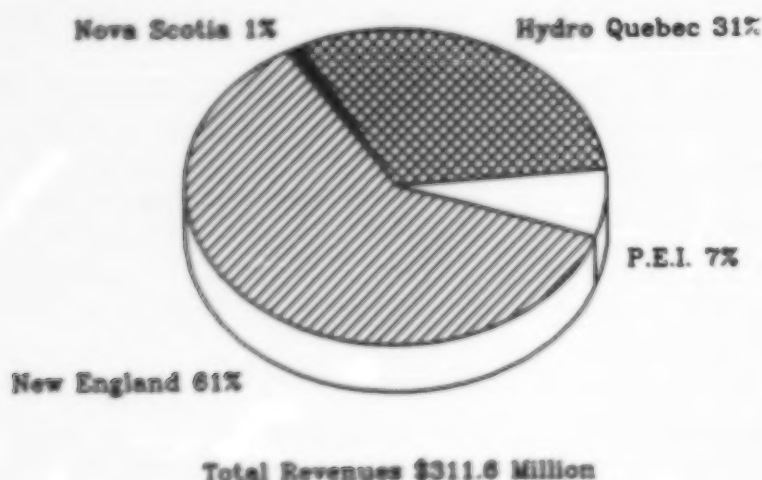


Figure 19 NB Power Revenues From External Sales, 1989/90.

Much of New Brunswick's electricity is already exported in embodied form through manufactured goods. About 90% of electricity used in the industrial sector (44% of provincial demand) is used for production of product destined for the export market.

Electricity is also a major export commodity in its own right. In 1988, the value of all exports from New Brunswick amounted to \$3.1 billion; and electricity accounted for 7% of this total. Electricity is the fourth largest export item, after wood pulp, refined petroleum products and newsprint. The value of electricity export is about equal to that of the fishing industry and surpasses that of lumber, concentrates from base metal mining and the food processing industry.

NB Power is interconnected with all neighbouring utilities and supplies virtually the entire load of Prince Edward Island and Eastern Maine Electrical Co-Op in Calais. It is expected this will continue. Annual exports to New England were in the \$200-300 million range in the 1980's, roughly half the amount was from Point Lepreau sales. In 1989/90, sales dropped to \$191 M reflecting decreased economy sales. The Lepreau firm-power contracts expire between 1991 and 1994. New England is becoming an increasingly difficult market place for NB Power exports. Major contributing factors include short-term surpluses, transmission access problems, and regulatory favourability to demand side measures and the use of natural gas for new generation. In 1990 a 20 year contract for 400 MW of peaking capacity with phase-back provisions was signed with Hydro Québec. It is expected that there will be increased cooperation with Hydro Québec and Nova Scotia in the future.

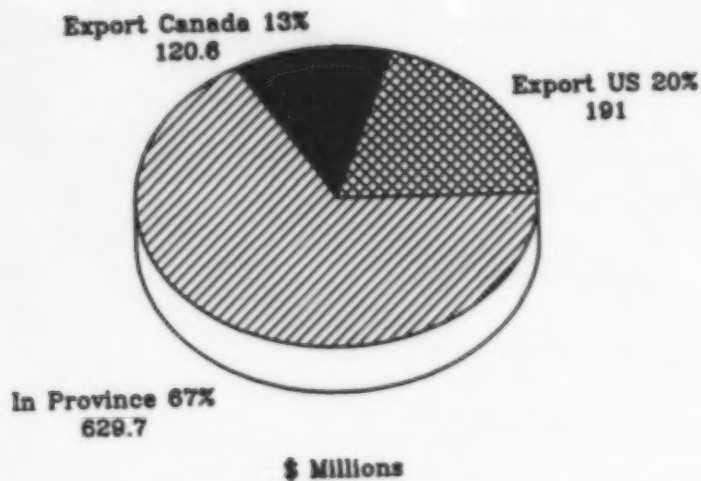


Figure 20 NB Power Revenues, 1989/90.

Exports have resulted in rate relief to in-province customers averaging 8% over the past years. New Brunswick's energy policy will be to continue to export providing the electricity exports result in cost savings to New Brunswick customers, and the new generating capacity can be phased back into the system to meet future domestic needs.

7.0 Energy Education

Although market forces can play a major role in controlling energy use, the long-term solution rests with better informing all age groups of the choices they are making for the environment and economy in their everyday actions. By informing all New Brunswickers of the strong interrelationships between energy and the environment they will be able to make individual informed choices in the products they consume and its "embodied" energy cost, as well as in the lifestyle that they live.

7.1 Schools

Fundamental to an informed public is the integration of energy and environment issues into the school system. After all, an energy policy developed today sets the tone and scene for our children's future. By becoming energy wise through education creates an awareness of the long term impacts of our actions. For example, the careless discarding of an aluminum soft drink can as opposed to recycling results in 90% more energy to produce the equivalent amount of aluminum from raw bauxite ore. To do this successfully requires the development and maintenance of new and existing energy and environment related programs in post secondary educational institutions in cooperation with business and industry.

Government will work cooperatively with existing organizations, such as the Energy Educators of New Brunswick, to ensure there is a balanced presentation of energy and environment in the education system.

7.2 General Public

There is a need to enhance general public awareness of energy and related issues. Public information programs can help clarify the nature, costs and benefits of choices to be made.

Initiatives to educate and inform all New Brunswickers of such issues as the climate change problem, their role in the problem and how they can help resolve it are essential parts of an energy policy. Significant components of any such initiatives include information, some demonstration and technology transfer in the area of energy use and efficiency.

Public awareness programs relating to efficient energy use, which historically only related to cost savings, must now include the environmental benefits.

The government of New Brunswick is confident that citizens of the province will respond favourably to low energy use lifestyle provided that they have a heightened awareness of all the implications for energy use.

To increase public awareness the government will work with in-province groups such as the New Brunswick Home Builders Association in promoting energy efficient housing. A toll free line will be established to provide an energy advisory service to all New Brunswickers. In addition government will work closely with the federal government and with NB Power and its "Energy Wise" program to coordinate public information programs.

Glossary

Terms

Energy	The ability to do work; the ability to cause change or the potential to cause change.								
Joule	The basic unit of energy in the metric system. One kilowatt-hour (Kwh) is equivalent to exactly 3,600,000 Joules. One British Thermal Unit (BTU) is equivalent to approximately 1,055 Joules.								
Power	The rate at which energy is delivered or the potential to be delivered.								
Watt	The basic unit of power in the metric system. One watt is the work done at the rate of one Joule per second.								
Metric Prefixes	<table><tr><td>kilo (k)</td><td>1000</td></tr><tr><td>mega (M)</td><td>1,000,000</td></tr><tr><td>giga (G)</td><td>1,000,000,000</td></tr><tr><td>tera (T)</td><td>1,000,000,000,000</td></tr></table>	kilo (k)	1000	mega (M)	1,000,000	giga (G)	1,000,000,000	tera (T)	1,000,000,000,000
kilo (k)	1000								
mega (M)	1,000,000								
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Equivalents

Terajoule	10^{12} Joules is the energy contained in 165 barrels of crude oil. This is approximately the energy consumed annually by 10 typical households.
Kilowatt-hour (kWh)	A unit of energy equal to the work done by one kilowatt acting for one hour. The most commonly used unit of electrical energy.
Megawatt (MW)	The unit of power equal to 1,000 kilowatts; used to measure the rate of output of electric power plants (eg. 653 MW Mactaquac Hydro Plant).

